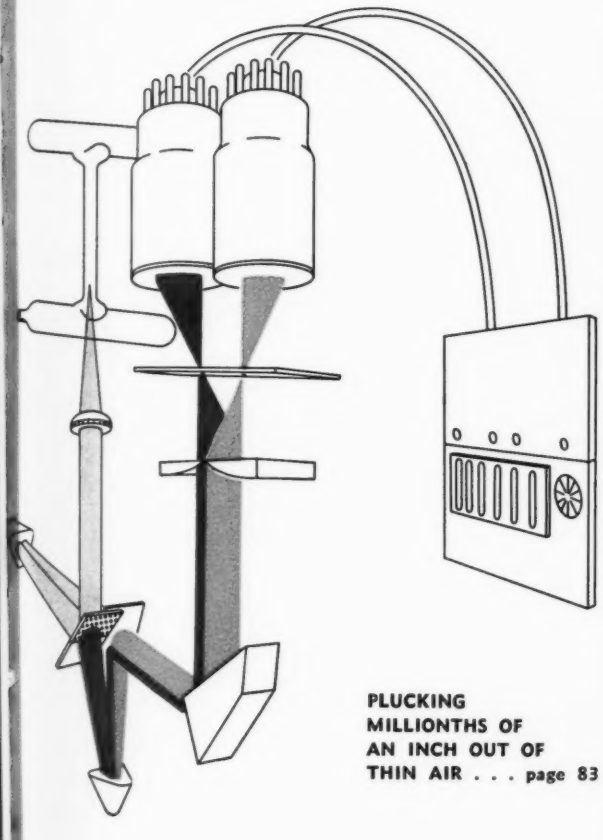
TOOLING & PRODUCTION

MARCH 1957



PLUCKING MILLIONTHS OF AN INCH OUT OF THIN AIR . . . page 83

IN THIS ISSUE

Talk of the Month — Observations on Quality Assurance and Reliability . . . . . E. G. D. Patterson 12

Foreman Selection . . . . . E. K. Taylor 57

Editorial: I+SQC+MC+R—Perfection . . . . E. W. Pennington 73

The Proper Use of Tool Steel to Make High Production Tools . . . W. E. Hoffman 74

Cold Forming Grows 78

Fixturing Boosts Gun Drilling into Automatic Production . . . J. Leipold 79

Tape-Controlled Table Modernizes Present Machine Tools 88

Production Data Now Automatically Recorded 93

Myths and Fallacies of Automation . . . . J. R. Bright 95

Multi-Diameter Hole Engineering — Boring Tool Trouble Analysis . . . F. Gable 99

The Engineer in Patent Suits . . . R. L. Spencer 110

DEPARTMENTS

Book Reviews 47
Coming Events 62
Shop Aids 66
Business Management Aids 121
What's New in Plastics 126
Helpful Literature 150
Products on Parade 172
Cumulative Editorial Index 224

FORM MILLING CUTTERS

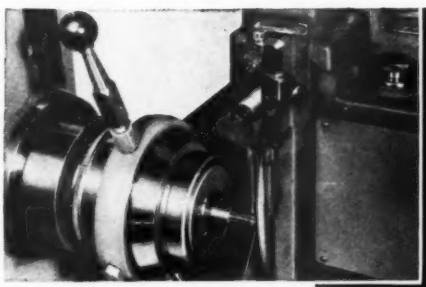
. . . Their Design and Application

. . . page 89

by Carl J. Oxford, Jr.
Research Engineer

Rotating or non-rotating

performs equally well!



Accuracy obtained on this thread grinding operation eliminated need of holding between centers.

Tapping to extremely close tolerances on a difficult job.

All users are unanimous in reporting the all-purpose value of the Levermatic. Not only is it *accurate* and *fast*, but it is exceedingly *versatile*. In fact, jobs that are turned or faced can be threaded or milled without removal from the chuck.

The Levermatic provides *instant* internal and external gripping and releasing (with no stopping of spindle on bar or arbor work). Faster, more accurate machining at lower costs! For every type of standard and special machine.

Send for Catalog

Learn how practical the Levermatic would be in your shop by seeing how other users have applied it to their jobs.

RUNS AS TRUE AS THE SPINDLE

Sutton Tool Company

STURGIS, MICHIGAN

TP-3

END MILLS ARE OUR BUSINESS . . .
NOT A SIDELINE

TO BEST SERVE YOUR NEEDS

For over twenty years our designing and manufacturing abilities have been exclusively devoted to producing highest quality end mills. Because end mills are our only business, we realize that universal acceptance of our product is obtained and maintained by continuously supplying the best end mills available.

Putnam manufactures and stocks over 1400 standard types and sizes of end mills. Thus, you can quickly and economically select the exact size and type to best meet your needs.

Putnam Distributors from Coast-to-Coast carry large stocks of standard end mills. Contact your neighbor, the local Putnam Distributor, he will recommend the best end mill for specific jobs, give you personalized service, and quickly supply your needs with the finest end mills obtainable.

5453

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 3

Special Size Reamers
ARE STANDARD WITH L&I

TWO MORE L&I EXCLUSIVES ...AT NO EXTRA COST!

DOWEL PIN REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .1230 thru .4995" Sets, tool

OVER & UNDER SIZE CHUCKING REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .124 thru .501" Sets, tool

These reamers are two more reasons why L&I is the source for a complete reamer line.
See your L&I Distributor.

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.
CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

MARCH 1957
VOL. XXII—No. 12
GEORGE J. HUEBNER, Founder

Personally speaking

Dear T&P Reader:

Did you ever wonder what other kinds of men read Tooling and Production? I was talking to a reader a little while ago and he asked this question.

My answer then was that all of the men and women who work together as a team to make T&P a monthly reality think of the 31,000 men who get T&P as a family. And they include themselves as part of that family (they read T&P, too).

In fact, there are a lot more men than those directly receiving it, who read it. You, for instance, might have picked up this copy in a co-worker's office. If so, you would be known to us as a "pass-along" reader.

But the point is that there is a "family" of T&P readers and our researchers tell us that the median age is 44 years; old enough for a man to have become pretty well established in his chosen field of work. Many of you are corporate officers or own your own shops. A lot of you are line production management men and are directly responsible for the uninterrupted flow of work in your plants.

About 72% of you are engineers by profession or position. And the median for the number of years you have been receiving T&P or its predecessor, Tool & Die Journal, is 8 years.

But regardless of statistics about the typical T&P reader, our editors know that each of you is an important person in his company — a real, live, breathing, thinking person — performing his share of the world's work, beset by all of the problems of life in mid-century America and compensated (we hope) by a measure of happiness and satisfaction that accrues to busy and successful men.

Sounds like I'm preaching, doesn't it. Well, maybe I am. This thinking gives all of us at T&P a sense of mission, a "feeling" for you — a belief in the importance of what we write for you.

Our editors know their stuff has got to be good to satisfy you. They work mighty hard at the job and from what you tell us — they succeed.

Cordially yours,

Ray L. Huebner

Publisher

READERSHIP Factors RESEARCH — EPA

Editorial Staff:
E. Willard Pennington, Editor
Watson N. Nordquist, Managing Editor
Carl F. Benner, Associate Editor
William E. Hoffman, Associate Editor
Carol E. Reuss, Associate Editor
Joanne Frolo, Assistant Editor
Ernest J. Urbas, Contributing Editor

Business Staff:
R. L. Huebner, Publisher
C. A. Hurt, Assistant Publisher
P. E. Hager, Production Manager
E. J. Brooks, Art Director
B. C. Jackson, Research Manager
E. N. DeCaprio, Contract Manager

Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office: 112 E. Chestnut Street, Louisville 2, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.
R. R. HUEBNER.....Chairman, Secretary, Treasurer
RAY L. HUEBNER.....President GEORGE J. HUEBNER, JR.....Vice President

Copyright 1957. Published monthly by Huebner Publications, Inc. Accepted as Controlled Circulation Publication at Louisville, Ky. Single copies, $1.00 each. U. S. subscription rate, $2.00 per year for metalworking plant operating executives and department heads. All other U. S. subscriptions $6.50 per year. All foreign subscriptions, $10.00 per year.

. . . NO BLACK MAGIC OR "HOCUS-POCUS"

We have no Secrets!

. . . JUST THE BEST DRILL BUSHINGS!

With precision American drill bushings you get: the *best* tool steel for extra long bushing life; the *best* 100% concentricity inspection; the *best* ordering method — eliminates confusing code numbers; the *best* range of standard sizes — smallest to the largest; and the *best*, most complete local stocks anywhere. Because we specialize only in the manufacture of drill jig bushings, American is your *best* drill bushing buy!

Send for our new 1957 catalog, price lists, and name of exclusive distributor near you.

American

DRILL BUSHING CO.

5107 PACIFIC BOULEVARD

LOS ANGELES 58 CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 5

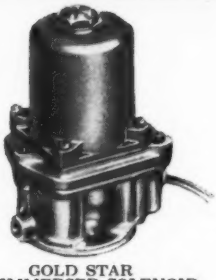
new

Ross air control

feature

long

WHITE STAR
SPOOL SOLENOID



GOLD STAR
OIL-IMMERSED SOLENOID

BLUE STAR MV

BLUE STAR TD

BLUE STAR

feature

match any head to

STRAIGHTWAY
NORMALLY
CLOSED

STRAIGHTW
NORMALL
OPEN

3 WA
NORMA
OPEN

Tests indicate a trouble-free life of over 25 million cycles for valves with the spool solenoid pilot section, and *more than 40 million for all other Starline* valves shown. Heads and bodies are completely and instantly interchangeable. Sizes from ¼" to 1¼". Even *more* Starline models coming later. Write for Starline data file.

Ross

OP

123 E

facts

Starline

valve series

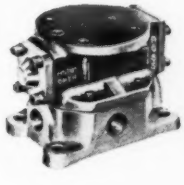
life

to any valve body!

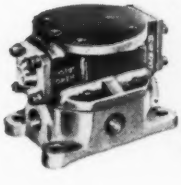
3 WAY NORMALLY OPEN

3 WAY NORMALLY CLOSED

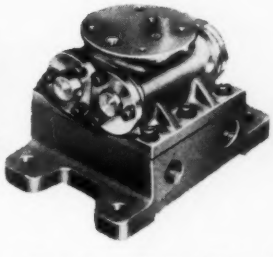
3 WAY NORMALLY OPEN



3 WAY NORMALLY CLOSED



4 WAY



A Galaxy of New Air-Control Stars Are Coming Your Way From

OPERATING VALVE COMPANY

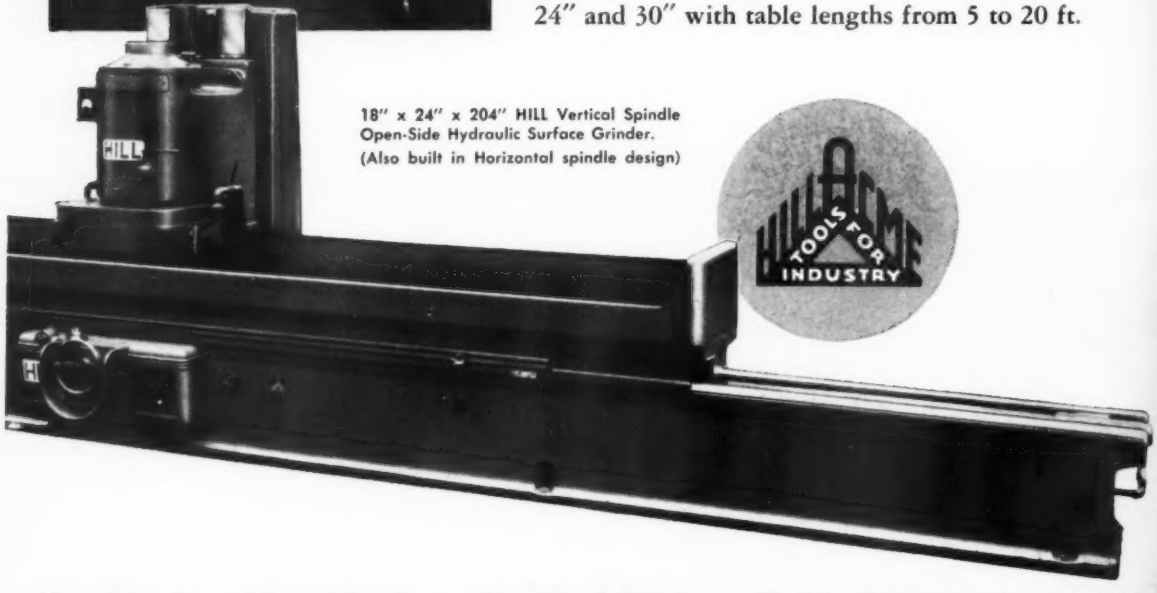
123 EAST GOLDEN GATE AVENUE • DETROIT 3, MICHIGAN

EVERY HEAVY DUTY SURFACE GRINDER SHOULD HAVE:

- *Open-side Accessibility*
- *100% Hydraulic Table Drive*
- *Built-in Spindle Motor*
- *Centralized Controls*
- *Low Pressure Hydraulic System*
- *One-Shot Lubrication System*
- *Adequate Safety Devices*

BUT THEY DON'T—

So GET A HILL with ALL the above features *plus* many other design improvements which insure rapid stock removal and accurate grinding of flat surfaces within the periphery of the grinding wheel. HILL Vertical Spindle grinders are built in table widths of 18", 24" and 30" with table lengths from 5 to 20 ft.



18" x 24" x 204" HILL Vertical Spindle Open-Side Hydraulic Surface Grinder. (Also built in Horizontal spindle design)

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1201 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

CIRCLE INFORM-A-GRAM KEY NO. 8

Northwestern TOGGLE-SHOE CLAMPS

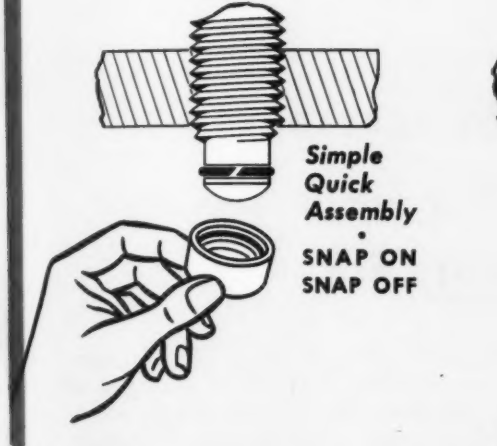
THREE NEW SOCKET TYPES! KNURLED SHAFT • KNURLED HEAD • HAND KNOB

ALL TYPES ARE INTERCHANGEABLE WITH *"SNAP ON-SNAP OFF"* ROUND OR V-PADS

PATENT APPLIED FOR

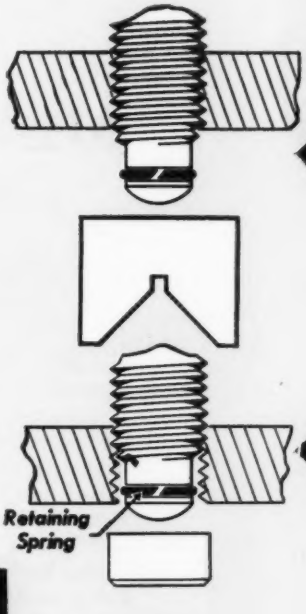
SIZES — ¼-20 to ⅝-11 **LENGTHS — 1" up to 5¼"**

There is a dealer near you that stocks Northwestern Tools—Write for information.



Simple Quick Assembly

• SNAP ON SNAP OFF



Retaining Spring

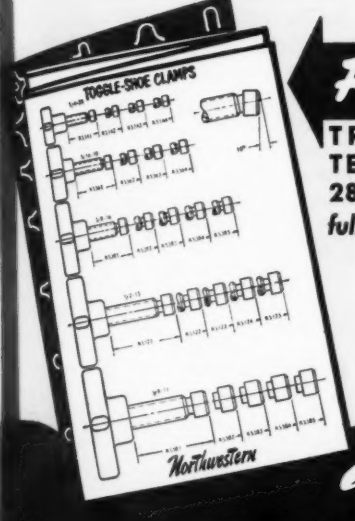
10° ADJUSTMENT in all directions

Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.

NO INTERFERENCE

Shoe only 1/16 larger than bolt

Short shoe design requires a minimum distance between fixture and the work.



Free

TRACING TEMPLATE 286 ITEMS ***full Scale •••***

HEAT TREATED for max. toughness

Screw is heat treated for long life—shoe is heat treated to prevent marring of work.

CIRCLE INFORM-A-GRAM KEY NO. 9

116 HOLLIER AVE. **Northwestern** DAYTON 3, OHIO

high scorer

. . . and in high speed steels, it's always REX

Crucible's REX® high speed steel always scores highest on performance—as it has for more than a half century. That's because it is consistently sound and uniform in structure . . . with dependable response to heat treatment.

But don't take our word for it. Check REX for yourself—by any test you choose. You'll discover that recent improvements in manufacturing techniques have made it better than ever—why REX is today, as it's always been, *the standard by which all other high speed steels are compared!*

REX is immediately available at all Crucible warehouses, or on prompt mill delivery. For a list of helpful data on REX and other *special steels*, write for a free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

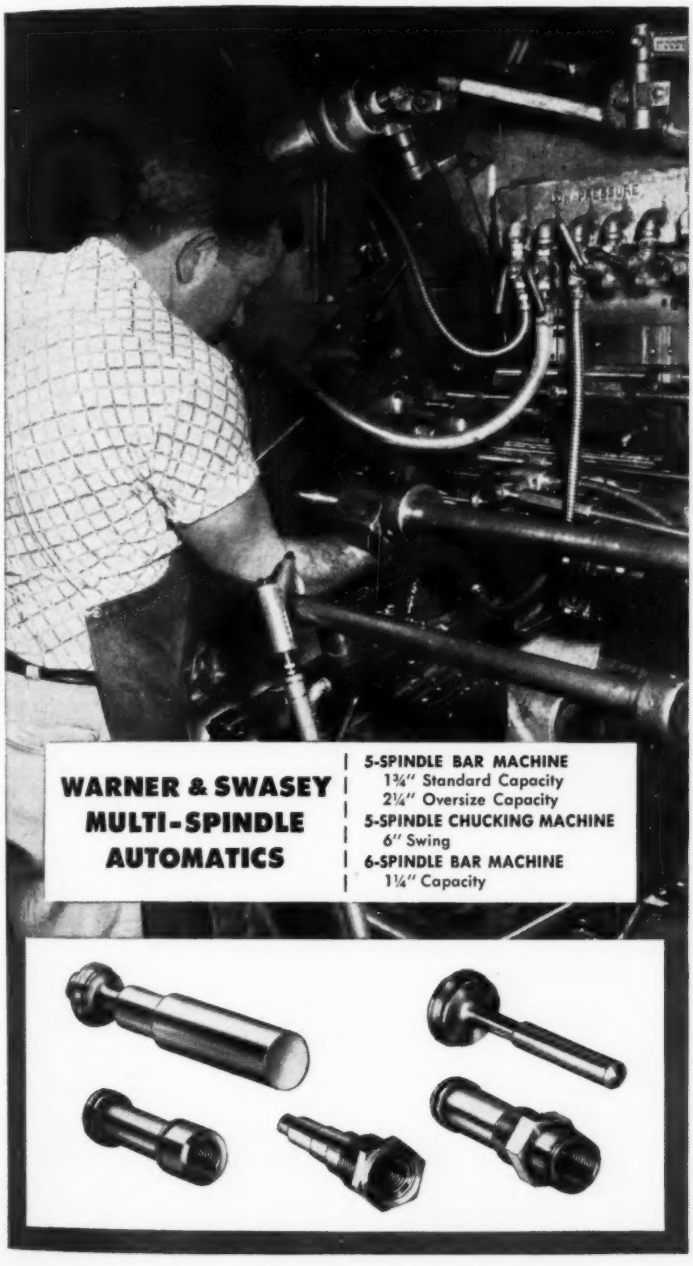
Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 10

WARNER & SWASEY AUTOMATIC CUTS SMALL LOT COSTS...

solves inventory problem for Cleco Division, Reed Roller Bit Company



Cleco Division, Houston, Texas, manufactures a wide variety of air tools. About 6000 different component parts must be machined each year—and, in order to keep reasonable inventory, in relatively small lots ranging from 100 to 1000 pieces.

While production on small hand-operated turret lathes kept inventory in line, it resulted in too high a cost per piece. On the other hand, economical production on conventional automatics required larger lot sizes and higher inventories.

In 1948, Cleco installed a Warner & Swasey 5-Spindle Automatic to solve both these problems. Its quick setup permits machining small lots at automatic rates —reducing cost per piece, and inventory at the same time.

This automatic has been operated on a two-shift basis—the equivalent of 16 years of one-shift production—with an exceptionally low record of downtime. Only $144 has been spent for repair parts. And despite this usage, cross slide form cuts to within .002" are easily held.

Foreman O. R. Palmer says: "We handle as much of our short run work as possible on the Warner & Swasey. Only when there's more such work scheduled than the machine can accommodate do we route the surplus to other automatics." Cleco operators like the automatic's quick-set quadrants which eliminate cam changing for feed strokes, its micrometer-dial cross slide adjustment, and general ease of operation.

If you'd like to reduce your machining costs on small and medium lot production —as well as long runs—call in our Field Representative. He'll be able to tell you whether your work can be done more profitably on a Warner & Swasey Multi-Spindle Automatic.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 11

he **HAD** to use a hand driver!

but **YOU** can use a Buckeye Air Tool!

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

Ever drive a screw with one finger? You can—with a Buckeye air-powered screwdriver. Just press the throttle and the job is done—instantly. You can drive ten screws this way in the time it takes to drive just one by hand. What's more, you won't burr the screw head or damage the workpiece.

Your assembly methods should be as modern as your product. They're not, if you're using manual methods, or even if you're using outmoded power tools. Our Catalog A-10, if you haven't seen it, discloses some very helpful information about modern assembly methods and Buckeye tools. May we send you a copy?

In Air Tools, Your Best Buy Is Buckeye

Buckeye Tools
CORPORATION
DIVISION 19 • DAYTON 1, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 12

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

OBSERVATIONS ON QUALITY ASSURANCE AND RELIABILITY

by E. G. D. Paterson
Director of Quality Assurance
BELL TELEPHONE LABORATORIES, INC.
New York, N. Y.

AS WE APPROACH THE QUALITY Assurance and Reliability from management's point of view, I think that we will find it helpful first to explore for a minute the circumstances which have directed so much attention to this matter of reliability. Some of us can remember when each automobile owner was quite satisfied with a reliability which demanded a tire-patch kit as a *sine qua non*. You may recall also that, even after the introduction of the self-starter, it was standard practice for many years to furnish a hand-crank.

Let us define the reliability of a product as the probability of its performing a specified task under a specified set of circumstances over a specified period of time.

Reliability is thus obviously an important attribute of quality. Nevertheless, until recent years, we in our Bell System quality assurance work have almost taken for granted the inherent high reliability of telephone product. In fact, while our quality rates on product take account of failures to meet specified requirements, we find that the majority of actual discrepancies represent marginal departures which might slightly shorten life, detract from appearance, or increase maintenance. In general, we have found that if a product met its requirements it could be relied upon to give long satisfactory service; and by long service in the telephone business I mean decades.

What has justified this assurance of reliability? Basically, technical knowledge and service experience, with the former resulting in large measure from the latter. We have

A talk presented at the Third National Symposium on Reliability and Quality Control in Electronics.

. . . *Continued on Page 16*

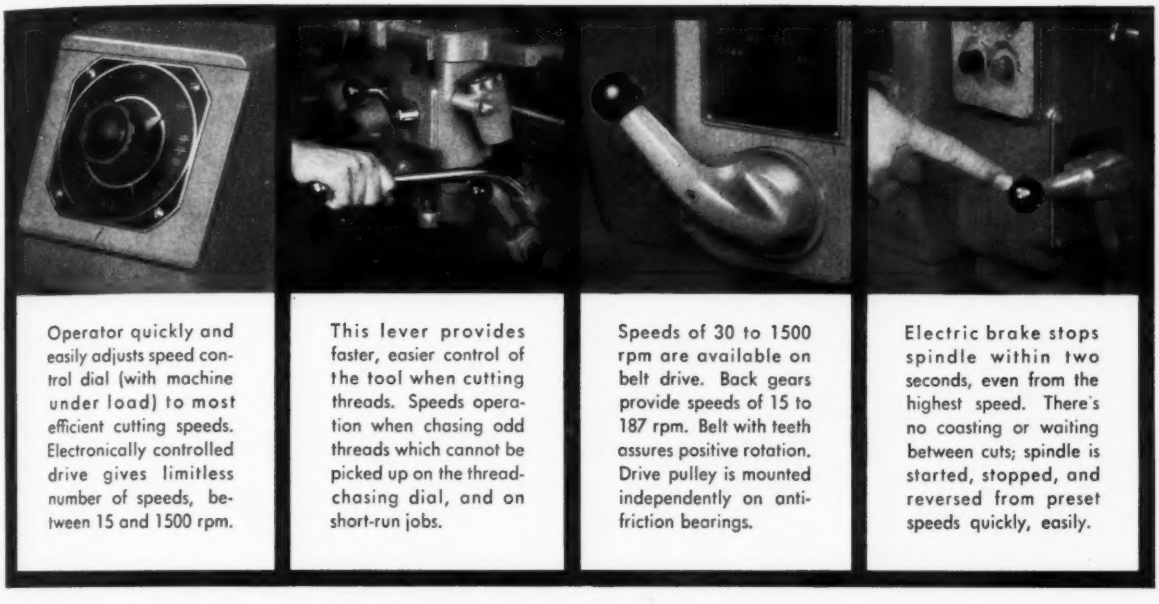
You get

top value per dollar

with a Hendey No. 2E Lathe

timesaving control features

make skilled hands more productive!



Operator quickly and easily adjusts speed control dial (with machine under load) to most efficient cutting speeds. Electronically controlled drive gives limitless number of speeds, between 15 and 1500 rpm.

This lever provides faster, easier control of the tool when cutting threads. Speeds operation when chasing odd threads which cannot be picked up on the thread-chasing dial, and on short-run jobs.

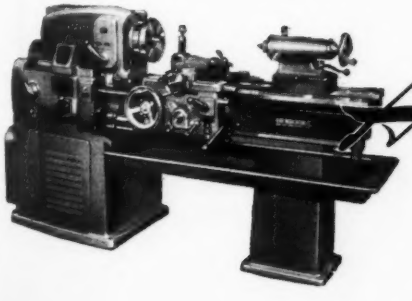
Speeds of 30 to 1500 rpm are available on belt drive. Back gears provide speeds of 15 to 187 rpm. Belt with teeth assures positive rotation. Drive pulley is mounted independently on anti-friction bearings.

Electric brake stops spindle within two seconds, even from the highest speed. There's no coasting or waiting between cuts; spindle is started, stopped, and reversed from preset speeds quickly, easily.

For general-purpose turning not requiring a geared drive, the Hendey No. 2E gives you top value per dollar . . . with more torque at low speeds . . . a more efficient drive and a more sensitive speed control . . . more of the versatile features you need to speed your jobs and control your costs.

This lathe is easy to operate at the most efficient cutting speeds. You get an infinite range, right at your fingertips. It's the only 14 in. general-purpose lathe that can be equipped *in minutes* with an optional tracer attachment for efficient contour turning on short-run jobs. In the moderate price class, the Hendey Model No. 2E pays for itself quickly out of savings. Contact your Hendey dealer for details and complete specifications.

for precision with production buy Hendey



Hendey **machine division**

BARBER-COLMAN COMPANY

37 Loomis St., Rockford, Illinois

BARBER COLMAN ®

CIRCLE INFORM-A-GRAM KEY NO. 13

Another new benchmaster

specially tailored for wide stock!

benchmaster
FIXED BED, GAP FRAME 2-TON PUNCH PRESS

Here's Benchmaster's latest... a little dandy measuring only 17¼" high, *but packing a 2-ton wallop!* Built with much wider spacing of the columns than usual, it easily accommodates stock 4" wide (feeding front to back) through the 4½" opening... *the ideal press for application to foil and hundreds of fast, light assembly jobs!* Husky construction, adjustable gibs and improved, heavy-duty sliding key-type clutch mean this little giant is *all* Benchmaster, through and through! For your *wide stock, low tonnage problems* ask for details on this and other Benchmaster models ... STANDARD, DEEP THROAT, BACK-GEARED, FIXED BED AND HALF PRESS TYPES in a wide range of tonnages.

Crankshaft at Main Bearings	¾"
Standard Stroke	¾"
Shut Height Bed to Slide, Stroke Down, Adj. Up, Std. Stroke	4⅛"
Other Strokes Available	1"
Shut Height for above Strokes	3⅞"
Area of Bed front to back and left to right	4½" x 7¼"
Bolster Plate Thickness	⅝"
Adjustment of Slide	½"
Hole in Slide for Punch Shank	¾"
Center of Slide to Frame	2¼"
Flywheel Diameter and Face	10¼" x 2"
Flywheel Weight (Approx.)	30#
Strokes per Minute	280-290
Motor H.P. and Speed	¼ HP 1725 RPM
Distance from Bed to Center of Shaft	9½"
Base Dimensions	8" x 8"
Overall Height, Bench Model	17¼"
Size Opening through Back	4½"
Shipping Weight Less Motor (Approx.)	98#

benchmaster

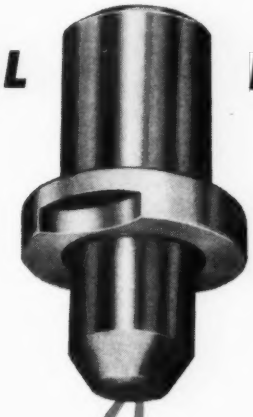
World's largest manufacturer of small punch presses and mills.

1835 West Rosecrans Avenue
Gardena, California

CIRCLE INFORM-A-GRAM KEY NO. 14

locate RIGHT ON THE NOSE!

WITH UNIVERSAL LOCATING PINS



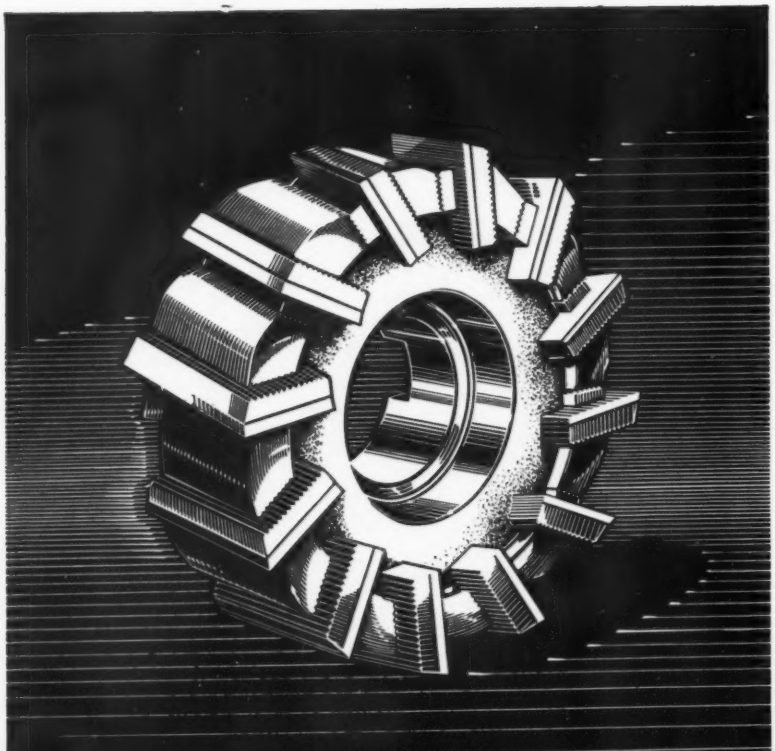
The accuracy of Universal Locating Pins assures you quick, accurate alignment in production operations. They are hardened and ground and held to close tolerances. All standard sizes—of round or relieved —in press fit, threaded or lock screw types including rest buttons are stocked and available for immediate delivery at a fraction of the cost of ordinary tool-room pins. Write today for new 98 page catalog showing the complete line of Universal quality products.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

194

CIRCLE INFORM-A-GRAM KEY NO. 15



A VERSATILE MILLING CUTTER?

Sure, that's the best description you could apply to a Go & Go inserted high-speed steel blade milling cutter. Here's a tool that's equally at home banging out high production day after day or down in the toolroom carefully carving out a new die. And you can use it on almost any material.

When blades wear, and they do, it's a simple matter to set them out, resharpen and put the cutter back in production. After you've squeezed the last bit of tool life out of the blades, just order new ones from stock and insert them in the cutter body. Blade cost is so low most shops keep several sets on hand all the time.

You can choose just about any style and size of inserted HSS blade milling cutter you'll ever need from the complete line of standards manufactured and stocked by Go & Go. For specifications, ask for Catalog "F". Go & Go also designs and manufactures special milling cutters in quantity. Check your nearest Go & Go representative for details.

GO & GO

GODDARD & GODDARD COMPANY
DETROIT 23, MICHIGAN
Engineering and producing tools that Go & Go since 1917.

CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 12

had detailed knowledge with respect to the environmental circumstances under which products must function. We have quite generally known the design parameters necessary to insure proper operation under these circumstances. We could almost always recognize and control the pertinent characteristics of the raw materials used in the product. With few exceptions, we could test and inspect for any deficiencies likely to affect reliability and could find and eliminate them.

Under these circumstances, we could determine pretty closely product reliability from sampling tests; and our acceptance criteria, together with our quality rating standards, were set primarily on the basis of rationalizing overall economic considerations and the quality of telephone service. With such a state of affairs — broad applicable experience and, quite generally, an ability specifically to define and delimit the pertinent factors — reliability, for a substantial portion of the products, is largely a function of the degree to which the product meets its specified requirements. ***Hence it (reliability) is predominantly in the hands of the production organization.*** For the large majority of telephone product — and this undoubtedly holds true for other industries — this is still the case today.

Finding Causes Of Unexpected Unreliability

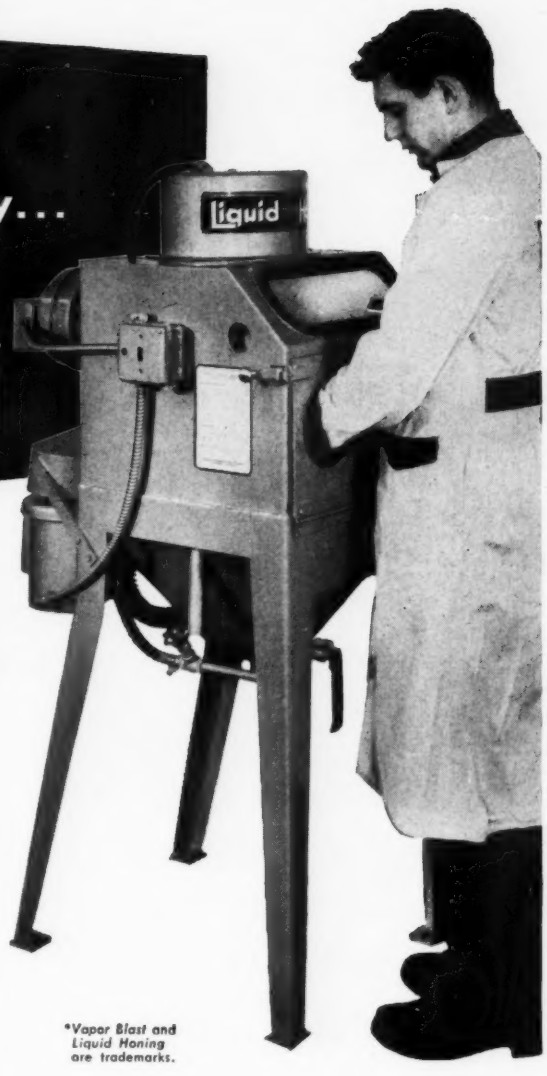
There were exceptions, of course, to this almost utopian situation from the standpoint of Quality Assurance. We encountered occasional instances where substantial proportions of product failed after a relatively short time in service, when we had expected it to last for many years. Almost invariably it developed that these exceptions were attributable, not to production irregularities, but rather to the effects of theretofore unknown or little known phenomena associated with a particular material or product functioning in a particular combination of service environments. These failures were assignable, in other words, to shortcomings in design. Let me cite a few such instances which have occurred over the past thirty-odd years:

1. The season-cracking of binding-post terminals resulting from the use of brass with too low a copper content, unrelieved internal stresses introduced in the forming operation, and exposure to atmospheric moisture. Today we use "high-brass" and stress anneal after forming.

2. The electrical breakdown between textile insulated conductors attributable to the migration and concentration of trace quantities of electrolytic salts in the textiles, the presence of normal seasonal humid-

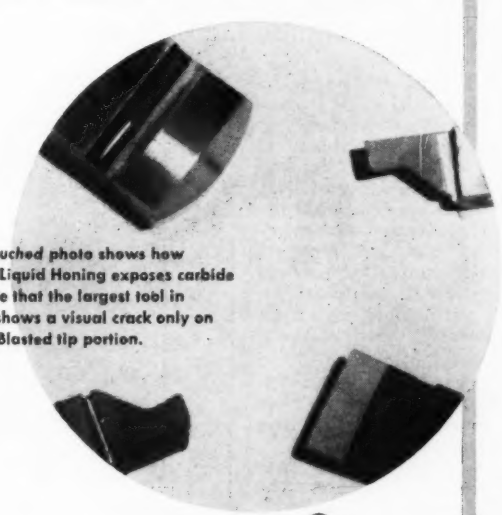
. . . *Continued on Page 24*

Detect Carbide Cracks Quickly, Positively... with V-B Liquid Honing*



Now you can prevent profit losses traceable to new or reground carbide tools that break because of cracks, porosity and other imperfections. Liquid-abrasive action flushes out the fine sintered material which, under grinding heat and pressure, often seals minute cracks and prevents detection by other methods. After Liquid Honing, fissures and other defects become *visually apparent* in a satin matte finish that remains dimensionally the same as the previous finish. Liquid Honing inspection processing is fast and thorough — more than 100 single-point tools per hour. And those tools, if not defective, last longer and cut better because they're free of burrs.

*Vapor Blast and Liquid Honing are trademarks.



This unretouched photo shows how effectively Liquid Honing exposes carbide cracks. Note that the largest tool in the group shows a visual crack only on the Vapor Blasted tip portion.

A Liquid Honing machine for carbide crack detection serves you in many other ways. Use it for surface conditioning, finishing, cleaning or descaling — often at production savings of 65% to 80%!

Write for complete information on case histories and low cost — only $550 to $1500 for a standard machine. And send a sample tool or part for free demonstration processing.

VAPOR V-B BLAST
MILWAUKEE, WISCONSIN

VAPOR BLAST MFG. CO.
3131 W. Atkinson Ave. • Milwaukee 16, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 17

Why the trend to heat-treated cap screws in the heavy equipment industry?

Chicago Screw engineers worked with leading manufacturers to develop the high-strength, heat-treated screws that take more punishment and greatly reduce fastener costs

Strength, and the ability to withstand severe punishment, are prime requirements for fasteners used in heavy equipment. As a leading fastener source for most of the top manufacturers of heavy equipment, CHICAGO SCREW conducts a thorough research and development program aimed at steadily improving fastener performance.

A major result of this program is the development of the CHICAGO *carbon-restored* heat-treated cap screw, now replacing bright-finish fasteners for most heavy equipment applications. Design engineers have found the far greater tensile strength of the heat-treated fastener (see chart) gives a better fastening with fewer—or smaller—screws. This means less weight . . . and a considerable reduction in fastener costs.

In addition to greater strength, CHICAGO heat-treated cap screws prove far superior in withstanding fatigue, wear, shock and vibration. This is because a major cause of fastener failure—a surface layer of soft, decarburized steel—is eliminated by our unique Carbon Restoration process. Vital surface carbon is restored in a scientifically controlled process during final heat-treating, producing a fastener that's uniformly hard from core to surface.

Our engineers will be glad to advise you on designing to best take advantage of heat-treated cap screws. For complete information on cost savings you can get in your products . . . and a detailed version of the condensed tensile strength chart at right . . . drop a line to our Standard Products Division.

HOW TENSILE STRENGTH COMPARES

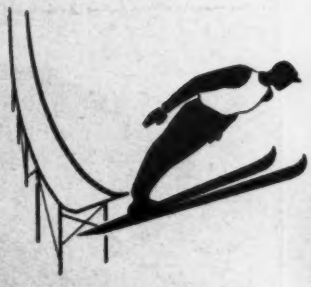
Diameter (Coarse Thread)	Bright Cap Screws Tensile Strength (Pounds)	Heat-Treated Cap Screws SAE Grade 5 Tensile Strength (Pounds)
¼	2,150	3,810
5/16	3,550	6,270
⅜	5,250	9,280
7/16	7,200	12,720
½	9,650	17,000
9/16	12,400	21,800
⅝	15,400	27,070
¾	21,400	40,100
⅞	29,500	53,040
1	38,700	69,590

THE CHICAGO SCREW COMPANY

DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872
2519 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

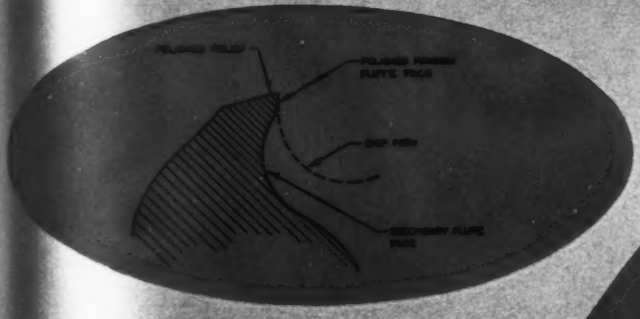
CIRCLE INFORM-A-GRAM KEY NO. 18

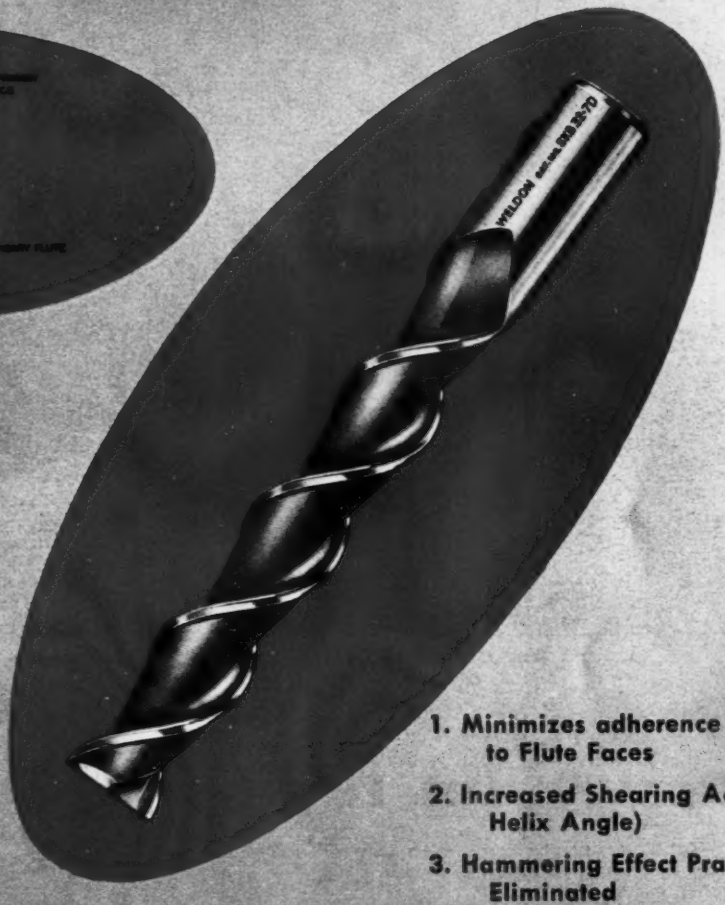
NEW! WELDON *Ski-Kut* END MILLS



FOR CUTTING ALUMINUM

PATENT APPLIED FOR





CUTTING ALUMINUM MADE EASIER, SMOOTHER AND FASTER

The primary flute face of the Ski-Kut End Mills, being narrow, definitely minimizes adherence of chips to the flute faces. Adherence or welding of aluminum chips contributes in a major degree to the difficulty in milling aluminum.

Greater feeds, longer tool life, better finish, easier operation of equipment are some of the advantages to be gained by the use of Weldon Ski-Kut End Mills for cutting aluminum.

1. Minimizes adherence of Chips to Flute Faces
2. Increased Shearing Action(45° Helix Angle)
3. Hammering Effect Practically Eliminated
4. Greater Feeds
5. Longer Tool Life
6. Better Finish
7. Easier Operation
8. Less Horsepower Required

A RADICALLY NEW DEVELOPMENT IN END MILL DESIGN FOR CUTTING ALUMINUM THAT SPEEDS PRODUCTION AND REDUCES COST.

Weldon SKI-KUT End Mills are available from stock in size from 1/4" to 2" in various lengths. For full information write for folder SKM-1

Weldon Distributors throughout U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

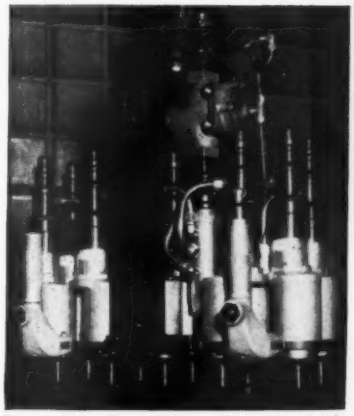
Keller 3-spindle, multiple nut setter used on moving assembly line. Spindle model is 16J43.

1 operation replaces 3

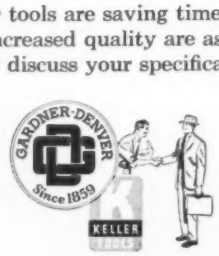
What happens when a Keller Tool multiple nut setter runs three bolts, simultaneously, to fasten gear case to base plate?

1. **ASSEMBLY TIME SHORTENED** over former method.
2. **ACCURATE NUT RUNNING.** Each spindle applies identical torque. Sets fasteners tight to manufacturing specifications.
3. **INDIVIDUAL INSPECTION** eliminated.
4. **FULL-TIME PRODUCTION** of two nut setters . . . 3250 units daily.

Keller tools are saving time in many production operations. Lower costs and increased quality are assured. A Gardner-Denver representative will gladly discuss your specifications at any time.



Versatile. One Keller Tool multiple nut setter . . . ten operations. Each spindle can apply individual torque to different size nuts.



ENGINEERING FORESIGHT—PROVED ON THE JOB
IN CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

GARDNER - DENVER

KELLER TOOL division, Grand Haven, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 20

Guarantee **TOP** Performance and Maximum Life!

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE HARDENED CHROME PLATED PISTON RODS

On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

On all Air and Hydraulic Cylinders

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

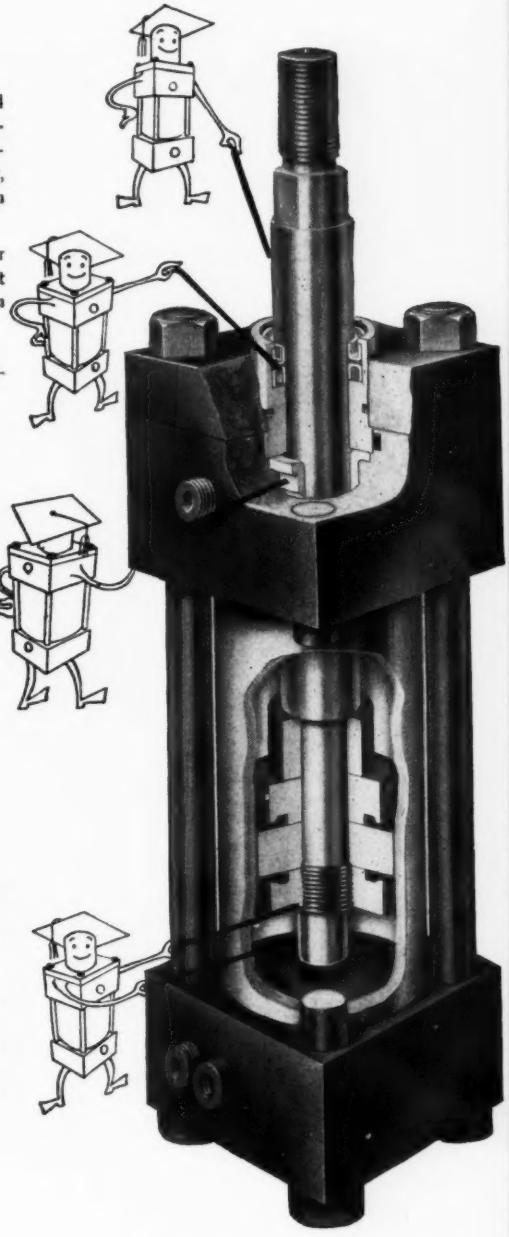
Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.)_____

"On all our future cylinder requirements, please specify the above quality features."

Signed_____

Title_____

NOTE. On all Miller Hydraulic Piston Seals: Leather Cup Seals are *standard*, Piston Ring Seals are optional *at no extra cost*, and "Teflon" Cup Seals are available *at extra cost*.

Member of the National Fluid Power Association

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • TOLEDO • CINCINNATI • COLUMBUS
PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY
BUFFALO • ROCHESTER • MINNEAPOLIS • GRAND RAPIDS • DETROIT • FLINT
FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE
KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE
DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • ATLANTA
TORONTO, CANADA and OTHER AREAS

Miller

MILLER FLUID POWER DIVISION
FLICK-REEDY CORP

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATOR
COUNTERBALANCE CYLINDERS

FALCON

KWIKLOK

QUICK CHANGE HOLDERS

with T. I. DRIVE

PAT NO 2612177

Decidedly New!

OUR—ADAPTERS—Will take SHELL END MILLS, BROWN & SHARPE And MORSE TAPERED SHANK STANDARD DRILLS & REAMERS, STRAIGHT SHANK END MILLS, JACOBS CHUCKS, FLYNN OFFSET BORING HEADS, FALCON T.I. DRIVE STANDARD INTERCHAINGEABLE COUNTERBORES, SOLID BORING BARS, FLOATING TAP HOLDERS & ETC.

—FALCON—

KWIKLOK-HOLDERS

Are the quickest of the quick.

Made with NATIONAL STANDARD TAPERS, BROWN & SHARPE, MORSE & ETC.

Just what you have waited for..

—YOU—Can have our latest Brochure just for the asking. It will give you all the PERTINENT ENGINEERING DATA You will want.

WRITE FOR YOUR COPY TODAY

Dept. K

END MILLS • FORM RELIEVED CUTTERS • REAMERS • MILLING CUTTERS SPECIAL TOOLS • MULTIPLE DIAMETER STEPCUTTERS • T. I. DRIVES ON ALL TYPES OF SHANK TOOLS • COUNTERBORES • KWIKLOK QUICK CHANGE TOOL HOLDERS, ADAPTERS AND ETC.

FALCON

Mailing Address: P. O. Box 4605
Mt. Elliott Station, Detroit 34, Mich.

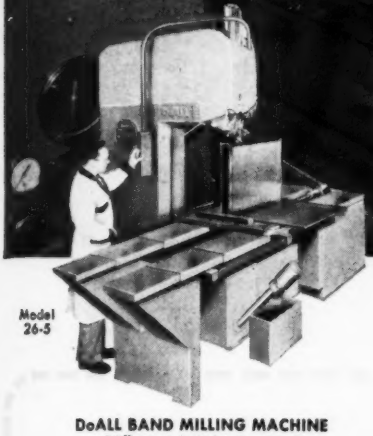
Plant Address: 20771 Ryan Road

SLICED OFF IN 55 MINUTES

Here is one of 25 pieces being accurately cut to within .002" per inch at 10 sq. in. per minute with one DoALL Demon HSS Blade on the:

NEW DoALL BAND MILL

- TRIM CASTINGS!
- SPLIT BIG BEARINGS!
- FACE FORGING DIE BLOCKS!



Model 26-5

DoALL BAND MILLING MACHINE
18" work height standard
26" throat depth
2" Demon HSS Blade
40" stroke • 2 ton capacity table
Var. speeds 55 to 10,000 FPM
Cuts to 10 sq. in. per min.

SMOOTH FINISH • LITTLE WASTE LOW COST

High-speed steel band cuts faster—lasts longer. DoALL Band Mill cuts fast to accomplish rough machining in shortest possible time, removes whole section from work piece in single pass.

SEE DoALL . . . BOOTH 160
WESTERN METAL CONGRESS
LOS ANGELES, CAL., MARCH 25-29

New Speed, Accuracy and Economy in Cutting Heavy Dies, Forgings, Plate, Castings

This new machine with positive table feed control brings the speed and economy of straight line metal parting with Demon HSS blades to the big jobs. Refacing or shanking heavy forging die blocks, ripping heavy plate and trimming heavy castings are only a few of the increasingly tougher, heavier cutting jobs you can do in a fraction of the time—*at a fraction of the cost* required with heavy, costly planers, shapers or milling machines.

You get big material savings, too. The DoALL Model 26-5 Band Mill removes entire usable sections of metal instead of reducing it to a pile of worthless chips.

Steel tired band wheels permit heavy tensioning of a rugged new 2" wide Demon HSS band. A powerful, smooth 40" stroke, automatic screw feed table on hand scraped, lubricated ways carries the work into the continuous-cutting band.

Here truly is the economy of band machining at its most efficient best—made possible by DoALL Band Machine engineering and DoALL's exclusive development of Demon blade, a heavy duty safety band tool of high-speed steel. The cutting speed and efficiency pictured above is just a sample of what your DoALL Engineer can show you about this dramatic new bargain in machine tools. Call him today or write for bulletin: **The DoALL Company, Des Plaines, Ill.**

DoALL *For Lowest Cost . . . do it on a DoALL!*

B-39

CIRCLE INFORM-A-GRAM KEY NO. 23

MACHINE PRODUCTS

Your Complete Line Source for . . .

KNOBS

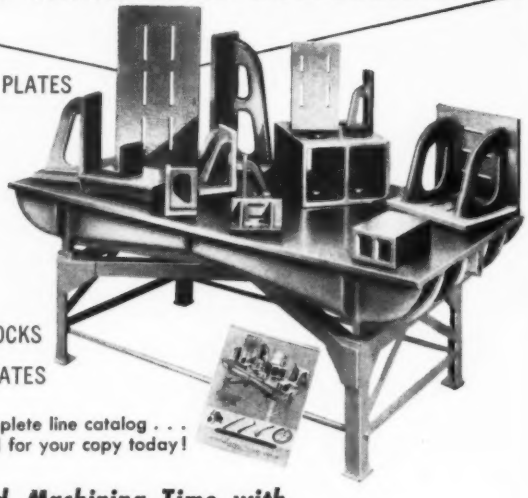
LEVERS

WHEELS & HANDLES

Cadmium plated and ready for immediate delivery in the style, size and quantity of your choice.

PRECISION SURFACES & ACCESSORIES

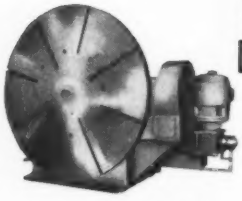
SURFACE AND LAYOUT PLATES
ANGLES • VEE BLOCKS
STRAIGHT EDGES
CYLINDER SQUARES
PARALLELS • CUBES
ALUMINUM ANGLES
ALUMINUM HEIGHT BLOCKS
ADJUSTABLE ANGLE PLATES

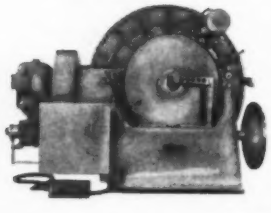


Free! Complete line catalog . . . send for your copy today!

Save Checking and Machining Time with

ROTAB *Rotary Tables*





Consider just a few of Rotab's many advanced engineering features. Parts can be rotated to any degree, adjusted to any angle from vertical to 30° below horizontal . . . no need, in most cases, for more than one set-up. Mechanical and optical setting systems are simple to use, easy to read and *highly* accurate . . . radial and angular settings can be measured *within 5* seconds of true position! In addition, motor-powered rotation and tilting facilitate fast, precise positioning.

Consider too, Rotab's versatility. It can be used for a variety of inspection and quality control operations . . . or for tool room machining. Get all the details. Write Machine Products today!

PRECISION ENGINEERED CHECKING AT ITS BEST!

MACHINE PRODUCTS *Corporation*

6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk from Page 16

ities, and standing potential differences. Today we wash our textiles to rigid requirements.

3. The formation of conducting paths within, or on the surface of, insulating separators caused by the migration of silver from silver-plated contacts in the presence of moisture, potential fields, and the small amounts of complex organic salts inherent in the insulating medium. Today we use different insulation or omit the silver-plating.

4. The cracking of the polyethelene sheath of underground cables caused by a combination of the use of too-low molecular weight polyethelene, the stress in the sheath, and the presence of a soap-like reagent, used as a cable lubricant for installation or present naturally in the surrounding sub-soil. Today we use higher molecular weight polyethelene in the sheath and verify resistance to cracking by accelerated cracking-resistance tests.

5. Transmission failures caused by the low resistance shorting paths resulting from filamentary growths (known as "whiskers") of metallic zinc from the zinc-plating on the supporting brackets within hermetically sealed filter units. Today we avoid the use of plating materials known to be subject to such growth.

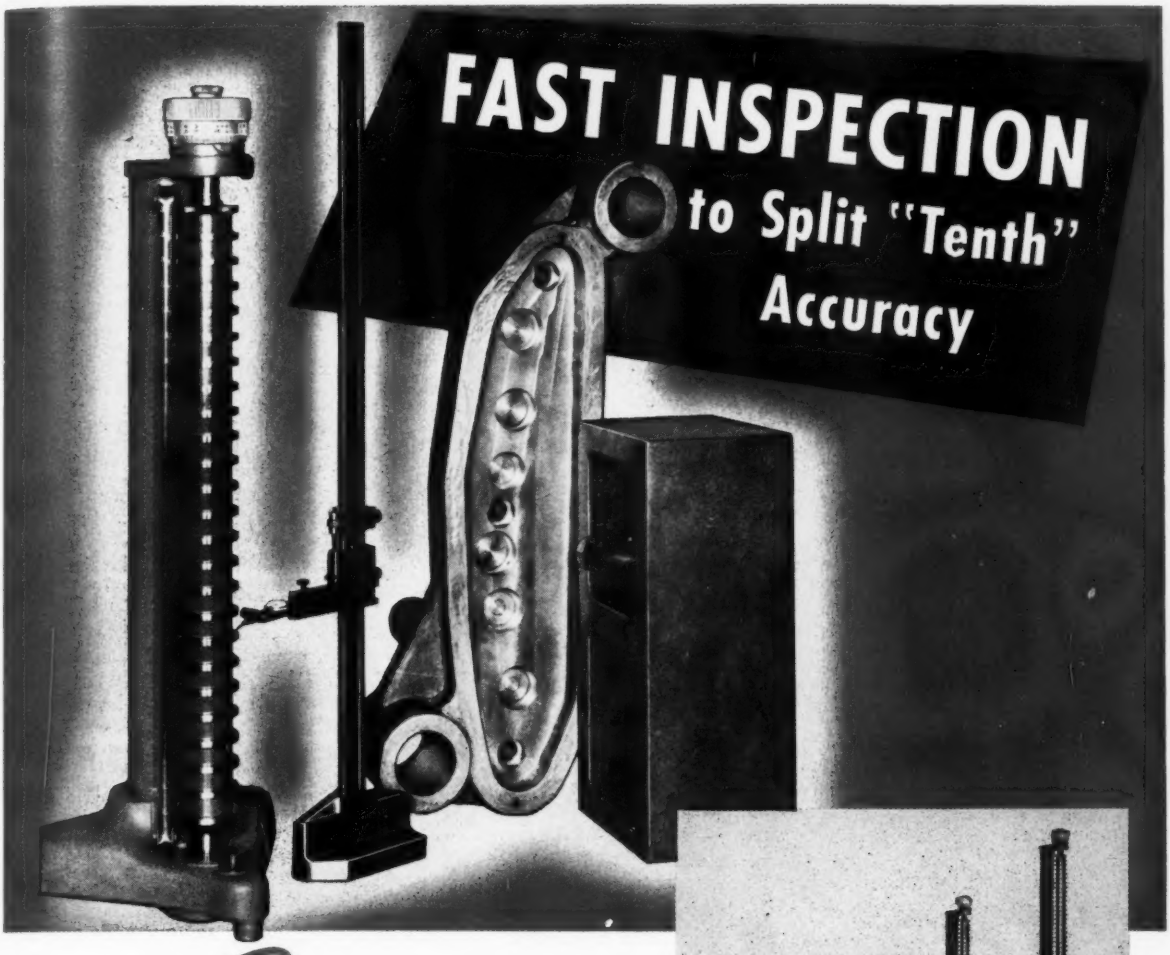
Like a great many other sources of unreliability, the above phenomena were all unsuspected at the time of the new designs in which they appeared. Recognition of their potentialities awaited actual failure in service followed by extensive research to ascertain their *modus operandi* and means for their prevention.

Accumulated Knowledge Helps Predict Reliability

Despite the complexity of the overall telephone plant, and despite the many potentialities for service failure, we can predict reliability fairly closely, for the great bulk of telephone product. This favorable situation, I believe, accrues from a wealth of accumulated knowledge concerning materials, processes, designs, products, and the requirements of service, which are all sufficiently closely analogous to those associated with new products as to enable us to synthesize reliability conclusions concerning the new products.

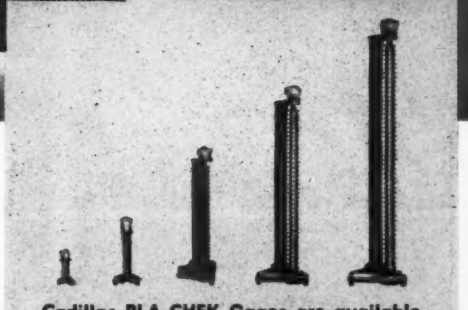
The design, production, and installation of a deep-sea cable is a case in point. One of the primary purposes of its installation is to increase service reliability. Many hours are spent in the careful planning and specifying by competent research and development engineers. These are devoted primarily to a clearer and more complete delineation and circumscription of those features recognized by experience as affecting reliability. Very few, if any, basic and fundamental design

. . . *Continued on Page 30*



Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24″ range to limits of less than .0001″. No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!



Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6″ and 12″ models for smaller jobs, to 24″, 36″ and 48″ models for larger inspections. Precision-made risers may be used with PLA-CHEK Gages —increasing the range of each 6″ to 12″.

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Cadillac
GAGE COMPANY
P.O. BOX 3806 • DETROIT 5, MICHIGAN

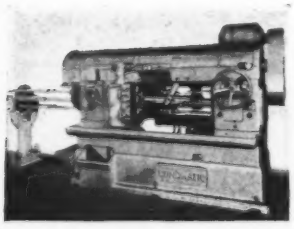
CIRCLE INFORM-A-GRAM KEY NO. 25

61 models

A machine not put to its best use is theoretically idle. Proper machine selection is an important factor in the profitable use of a multiple spindle automatic. So extensive are the demands on this type of lathe that no single model—or number of models—can be expected to efficiently handle the wide range of work available.

To excel in any range of work a multiple spindle automatic must be specifically designed for that range. That is why CONOMATICS are provided in so many models. In no other way can the purchaser be assured of the best possible machine for his particular requirements.

Write for your copy Today



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 26

Business-machine parts stamped with dies made by Eglinton Carbide Products, Inc., Lincoln Park, Mich.

Stamp pre-tempered steel .020 to .040 in. thick . . .

DIES MADE WITH CARBOLOY® CEMENTED CARBIDE SAVE BURROUGHS CORPORATION $300,000 A YEAR!

Dies equipped with Carboloy® cemented carbide now enable Burroughs Corp. to stamp business-machine parts from pre-tempered steel 2-4 times thicker than previously possible.

Parts made from pre-tempered (instead of annealed) stock come out of the dies finished . . . and made to required hardness. This permits Burroughs to eliminate many secondary operations. On one of the parts shown above, for example, heat treating, shaving, straightening, and five other operations are eliminated. Yearly saving on this part alone amounts to over $300,000 . . . and more than 10,000 hours of production time.

These savings far more than pay for carbide dies. In addition, carbides bring new savings in downtime and grinding costs because of their phenomenally long service life. A carbide die has stamped 1,000,000 pre-tempered steel parts per grind . . . while steel dies producing the same part from *annealed* stock had to be re-ground after only 10,000 parts.

Our engineers will work with you or your die maker on the application of Carboloy Cemented Carbides to your dies. For more information, write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Road, Detroit 32, Michigan.*

Progress Is Our Most Important Product

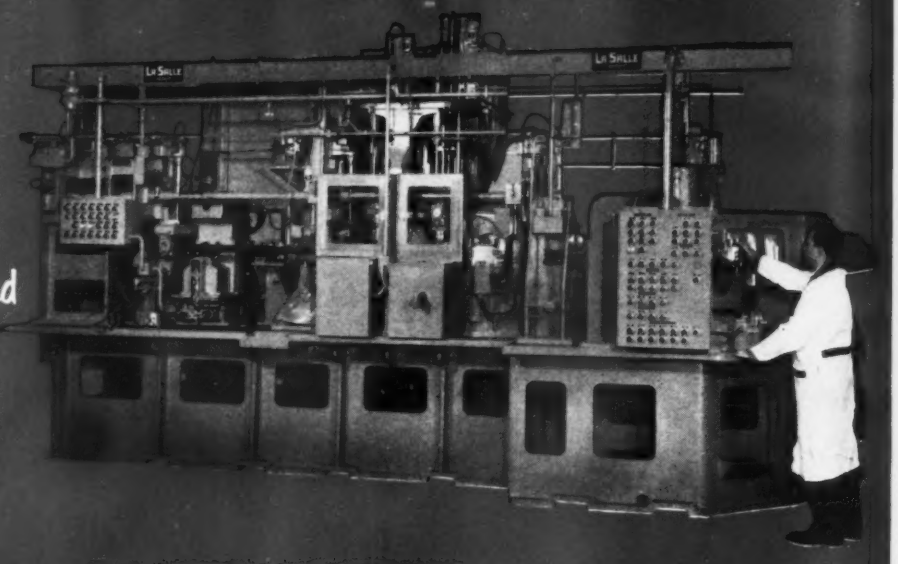
GENERAL ELECTRIC

CIRCLE INFORM-A-GRAM KEY NO. 27

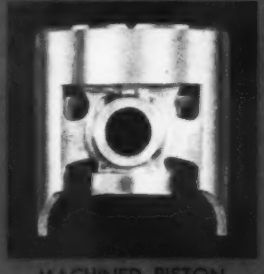
La Salle dial-inline-amatic

New Automated Piston Line

a dial type machine and an in-line type machine combined to form a single fully automatic unit!



PERMANENT MOLD



MACHINED PISTON

fully automated 14-station unit

The pistons, as they come from the mold, are fed, on conveyor, directly to this new unit. They pass thru 5 stations in the "Dial Type" section, and 9 stations in the "In-Line Type" section of the machine. And, the pistons are never slid, rolled or bumped.

series of operations performed

It mills off the gates and risers; pierces the wrist pin hole, and the window around the wrist pin hole; hollow mills the piston OD; faces the piston head; faces, and chamfers the skirt of the piston; weighs, and gages each piston; and, rejects pistons found to be over size, over weight, under size or under weight.

produces 400 pistons per hour

Furthermore, this unit will handle, any one of 3 different pistons, merely by changing the position of the selector switch, and the fixture locaters.

maximum flexibility for model changes

The shuttle mechanism can be adjusted for different size and shaped pistons, which automatically allows for future parts design changes.

unitized construction

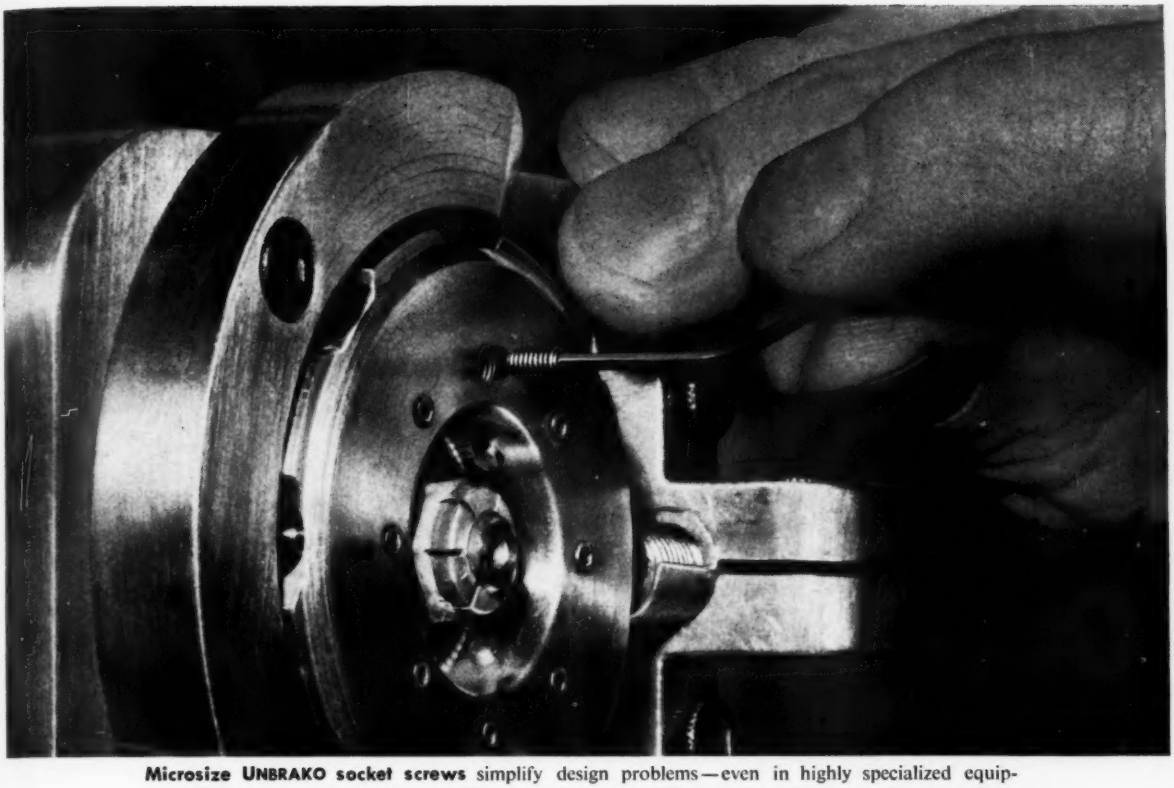
It's built to J.I.C. Hydraulic and Electrical standards. There's automatic lubrication throughout. And, there is a chip conveyor provided in the base of the unit.

La Salle tool, inc.

ENGINEERING & BUILDING
SPECIAL MACHINERY

3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 28



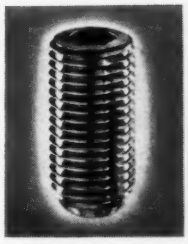
Microsize UNBRAKO socket screws simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

Miniaturize with UNBRAKO set screws

HEAT-TREATED ALLOY STEEL*
PLAIN CUP POINT
Class 3 Fit Standard

Diameter		Threads per inch NC	Threads per inch NF	L Overall Length	Recommended Installation Torque in Inch-Pounds NC	Recommended Installation Torque in Inch-Pounds NF	Weight per Box of 100 in Pounds
#0	D .060 F .028	..	80	1/16	..	.5	.01
		..	80	3/32	..	.5	.01
		..	80	1/8	..	.5	.01
		..	80	5/32	..	.5	.01
		..	80	3/16	..	.5	.01
		..	80	1/4	..	.5	.01
#1	D .073 F .035	..	72	1/16	..	1.5	.02
		..	72	3/32	..	1.5	.02
		..	72	1/8	..	1.5	.02
		..	72	5/32	..	1.5	.02
		..	72	3/16	..	1.5	.02
		..	72	1/4	..	1.5	.02
#2	D .086 F .035	56	..	1/16	1.5	..	.03
		56	..	3/32	1.5	..	.03
		56	..	1/8	1.5	..	.03
		56	..	5/32	1.5	..	.03
		56	..	3/16	1.5	..	.03
		56	..	1/4	1.5	..	.03
#3	D .099 F .050	48	..	3/32	5.0	..	.04
		48	..	1/8	5.0	..	.04
		48	..	5/32	5.0	..	.04
		48	..	3/16	5.0	..	.04
		48	..	1/4	5.0	..	.04

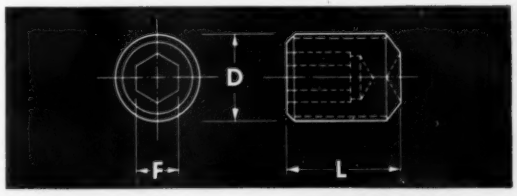
*Also available in stainless steel



You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

Ask your authorized industrial distributor about microsize UNBRAKO socket screws today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.



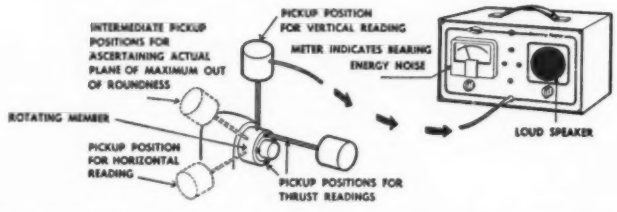
STANDARD PRESSED STEEL CO.

UNBRAKO® SOCKET SCREW DIVISION SPS

JENKINTOWN ■ PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 29

NEW
SPERRY BEARING TESTER
PINPOINTS
MACHINE WEAR AND
MISMATED PARTS!


INTERMEDIATE PICKUP POSITIONS FOR ASCERTAINING ACTUAL PLANE OF MAXIMUM OUT OF ROUNDNESS
PICKUP POSITION FOR VERTICAL READING
METER INDICATES BEARING ENERGY NOISE
ROTATING MEMBER
LOUD SPEAKER
PICKUP POSITION FOR HORIZONTAL READING
PICKUP POSITIONS FOR THRUST READINGS

Designed especially for shop use, the Bearing Tester detects the most minute wear in any rotating, sliding or moving part . . . assures precise, dynamic fitting of mating parts on the production line. It is an ideal "sentinel" for every type of plant maintenance and quality control program.

The Bearing Tester consists of a metal probe, or pickup, and a compact electronic amplifier. Any malfunctioning in the moving part under test is transmitted through the probe and shows itself both by a change in the noise level and the noise pattern visually presented on the tester's calibrated dial. It also registers through the tester's loudspeaker. Lightweight and easily portable, the Sperry Bearing Tester is a positive asset to preventive maintenance, quality control and receiving inspection.

The *Sperry Bearing Tester* story is given in our *Bulletin 61-105*, with text on its operation and information on testing interpretation. Write for your copy.

400 Shelter Rock Road Danbury, Connecticut

sperry products INC.
FIRST IN ULTRASONIC INSPECTION

CIRCLE INFORM-A-GRAM KEY NO. 30

. . . Month's Talk from page 24

innovations are introduced. Rather, individual components already known to be good are refined in design to be better. Production processes are specified in detail and followed meticulously. Scrupulous cleanliness precautions are taken during all phases of manufacture. Verifying inspections and tests are employed at each stage of production. Quality Assurance efforts are greatly intensified.

Today, the boundaries of man's knowledge of basic science and his ability to apply this knowledge are being pushed back at an ever increasing rate. To an increasingly greater extent, we find ourselves concerned with products for which we can find no suitable counterparts with respect to design, or use, or both. These new products are complex both as to design and construction. They are often drastically limited with respect to size and weight. Some of them are subjected to new orders of magnitude of stress, shock, vibration, acceleration, and rapid temperature changes, and to combinations of these which often are unknown and not easily ascertainable. They employ many parts and minor components assembled from widely scattered manufacturing sources with varying and often unknown pertinent quality characteristics. They must meet operating limits which in many cases are comparable to the best accuracies obtainable in testing equipment.

Products More Complex; Reliance Emphasis Shifts

To an increasing degree, the end requirements cannot reflect the total design intent and greater emphasis and reliance must be placed upon the requirements on materials, processes, piece-parts, and assembly, and the ability to withstand simulated severe service conditions. Measurements made specifically to ascertain reliability are often costly, destructive, and time-consuming. Service demands frequently prohibit extensive field trials under actual service conditions.

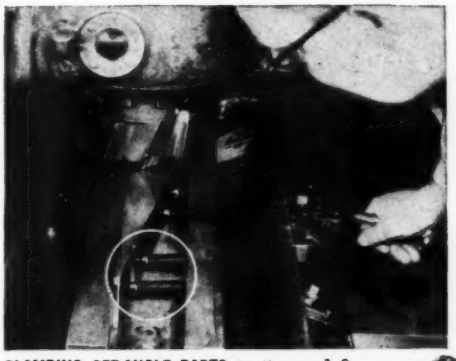
These are some of the factors which combine to make both the prescriptions for and the measurements of reliability an extremely difficult problem. As the concomitants of reliability become more complex and less easily recognized, and increasing proportion of the design intent must be covered by indirect (means to an end) rather than functional (end) requirements.

Since it is more difficult to specify completely adequate requirements of an indirect nature, the engineer's role in insuring reliability becomes not only correspondingly more difficult but more important. This does not mean that the producer's obligations with respect to reliability have

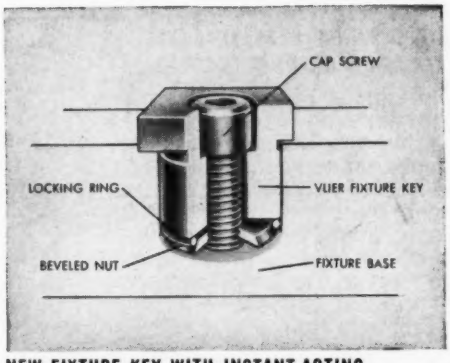
. . . *Continued on Page 34*

What can be done to lower YOUR tooling costs?

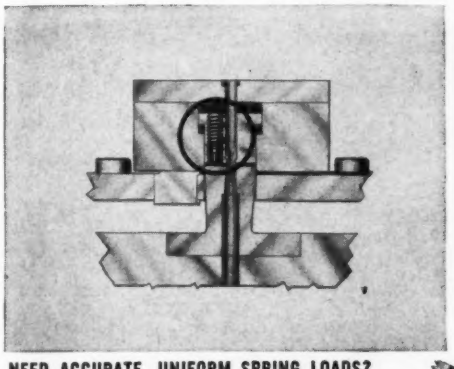
Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.



CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.



NEW FIXTURE KEY WITH INSTANT-ACTING, INTEGRAL LOCK eliminates unnecessary drilling and tapping operations to mount keys in fixture base. Holds key securely, permits quick change of key size for different table slots. Insures perfect alignment of jigs and fixtures on table.



NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.

THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.

Where can your tool room save?

Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties—applications where expensive, complicated, home-made devices are now being used. *Why not write for your copy of the new 1956 Vlier catalog today?*

Originators of small parts that make a big difference in tooling costs!

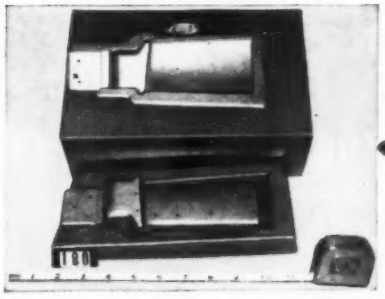
VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 31

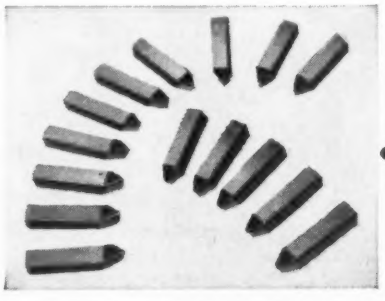
FORGING DIE

Material: Heppenstall 'A'
Conventional Machining
Time: 40 hours
Elox Setup & Machining
Time: 8 hours
Saved: 32 hours
Machine tool: Elox Standard M-500
Electrode: Cast Elo-met #3
Customers report 75% time saving in re-working dies after washout . . . no annealing is necessary.



TUNGSTEN CARBIDE SINGLE POINT TOOLS

E D M produces 14 identically machined tools per hour. Times include roughing and finishing, machining both faces, nose radius and top. Radius held to ± .001". Tools were produced by 1 man operating 2 Elox Tool & Cutter Grinders, using a brass wheel. Users report Elox ground tools give greatly increased life when compared to abrasive ground tools.



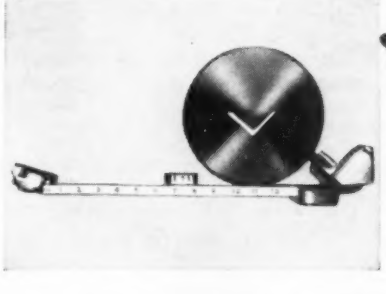
EMBOSSING DIE

Material: Air Hardened Tool Steel
Die consists of 1,250 squares machined .100" x .030" deep in the bottom section of the die. Sharp corners on each square had to be maintained.

Conventional Machining
Time: 227 hours
Elox Setup & Machining
Time: 10 hours
Saved: 217 hours
Machine Tool: Elox Standard M-500
Electrode: Free machining brass

EXTRUSION DIE

Material: Air Hardened Tool Steel
Conventional
Machining Time: 4 hours
Elox Setup &
Machining Time: 1 hr. 38 min.
Saved: 2 Hrs. 22 min.
Machine Tool: Elox Standard M-500
Electrode: Free machining brass
Machining is done after final heat treating . . . eliminating the possibility of distortion.



FROM THE HEART OF

EDM

. . . 4 jobs that prove

Elox puts you ahead of competition

These jobs were done for Elox customers in our "Prove It" Division. There's more to them than just "man hours" saved. The Elox sales engineer in your area would like to give you all the details about these and other applications of Electrical Discharge Machining. Why not write . . .

elox corporation of michigan *T. M. Reg.

1834 N. Stephenson Highway
Royal Oak 3, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 32

Namco COLLAPSIBLE TAPS

FOR ROTATING OR STATIONARY-SPINDLE MACHINES

for smooth, clean thread form... fine fit... uninterrupted tapping... on long or short runs

POSITIVE PRECISION— Compact construction and unique core piece design assures rigid, full-length chaser support; heavy body supplies ample side support.

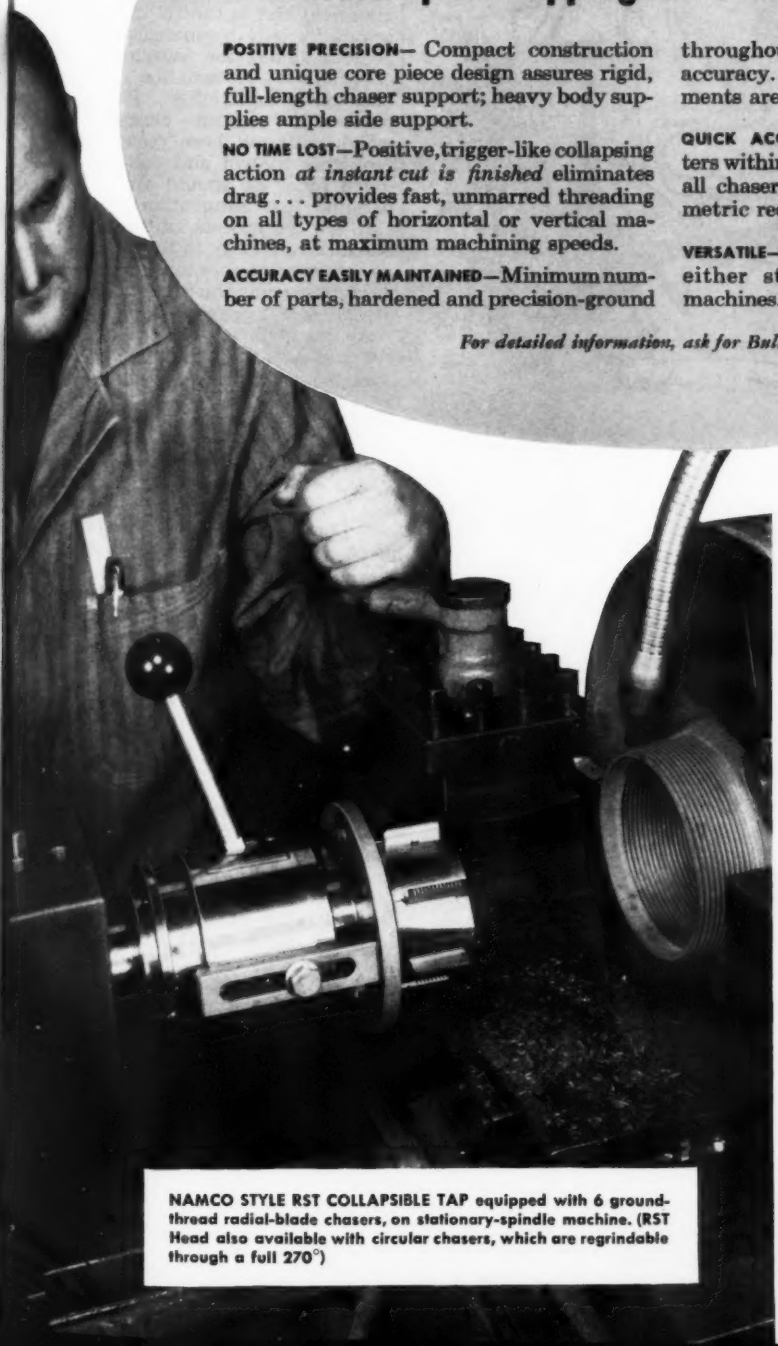
NO TIME LOST—Positive, trigger-like collapsing action *at instant cut is finished* eliminates drag . . . provides fast, unmarred threading on all types of horizontal or vertical machines, at maximum machining speeds.

ACCURACY EASILY MAINTAINED—Minimum number of parts, hardened and precision-ground throughout, assures less wear—greater accuracy. Less down time because replacements are fewer and easier.

QUICK ACCURATE ADJUSTMENT for all diameters within range of head. One screw adjusts all chasers, *simultaneously*, to precise diametric requirement.

VERSATILE—Same RST Head can be used on either stationary or revolving-spindle machines.

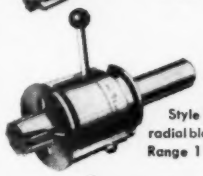
For detailed information, ask for Bulletin DT-52



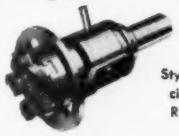
NAMCO STYLE RST COLLAPSIBLE TAP equipped with 6 ground-thread radial-blade chasers, on stationary-spindle machine. (RST Head also available with circular chasers, which are regrindable through a full 270°)

A WIDE RANGE OF SIZES AND TYPES

Style RSA.—Solid, adjustable. Range 1¼" to 4".



Style RST.—With radial blade chasers. Range 1¼" to 4".



Style RST.—With circular chasers. Range 3" to 5"

Style RES-L. Range: With radial chasers, 2¾" to 4"; with circular chasers, 4½" to 13⅜".

National Acme

THE NATIONAL ACME COMPANY
169 EAST 131ST ST., CLEVELAND 8, OHIO
SALES OFFICES: Newark, Chicago, Detroit

Call Pioneer now...

Why worry about where to find competent designers and engineers of dies, fixtures, tools and gages.

Pioneer has them for you.

Our highly skilled tool designers and engineers are the permanent solution to engineering overloads in many tool and process engineering departments like your own.

They will be ready to go to work when and as you need them. Eliminate worry about temporary overloads and excessive payrolls. Call Pioneer headquarters now.

SINCE 1931 **Pioneer ENGINEERING & MANUFACTURING CO., INC.**
Telephone TWinbrook 3-4500
19669 John R Street, Detroit 3, Michigan

INDUSTRIAL ENGINEERS, CONSULTANTS & DESIGNERS
BRANCH OFFICES IN DAYTON, OHIO, WASHINGTON, D. C. and TORONTO, ONT., CAN.

CIRCLE INFORM-A-GRAM KEY NO. 34

. . . Month's Talk from page 30

been removed, or his task lightened. Quite the contrary. His difficulties have increased with the complexity of the structure, the minimizing of tolerances, the reduction of clearances, and his need to insure the quality of each of the myriad items constituting the overall assembly. Indeed, he finds it difficult to procure the precision processing equipment and human skills required.

"Automation Not A Panacea For Reliability"

To a much greater extent than before, the producer finds his processing methods circumscribed by engineering requirements. Where it can be economically justified, automation may help him to control quality, but ordinarily only by increasing homogeneity among the individual units of product. Automation is not a panacea for reliability. It will not necessarily control characteristics which have not been recognized as requiring control and suitably provided for. We should always bear in mind that automation is the result, not the process, of thinking. To enhance reliability in the production phase, extreme care must be directed toward insuring the use of individual components or parts which themselves meet their greatly elaborated requirements. This is particularly true with respect to requirements that relate to life or aging. Details of assembly, wiring, and connecting assume added importance. Clearances, and component and wiring spatial relations become critical. All of those features which we characterize under the general heading of good workmanship must be adhered to strictly.

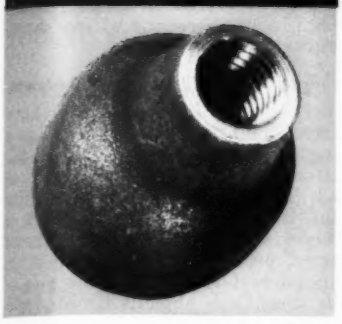
As has been described elsewhere*, Quality Assurance includes a number of closely inter-related activities. One of these, the Quality Survey, appears to be uniquely constructive with respect to the reliability program. It is Quality Survey which, of all the Quality Assurance activities, gets closest to the actual production processes. This is the activity, moreover, which aroused the greatest interest and appeal to the numerous suppliers involved in the introduction of a Quality Assurance program concerning guided missiles.

A Quality Survey comprises an over-all review of all factors relating to the quality of a particular material, component, assembly, or system to insure the attainment and maintenance of the desired level of quality (including reliability). It involves, among other things, critical evaluation of the adequacy and clarity of the design requirements; of the manufacturing requirements and processes; of the inspection tools,

*"An Overall Quality Assurance Plant"—**Industrial Quality Control**, Vol. 12, pp. 32-37, May, 1956.

. . . *Continued on Page 36*

Bodine



CASE HISTORY NO. 43

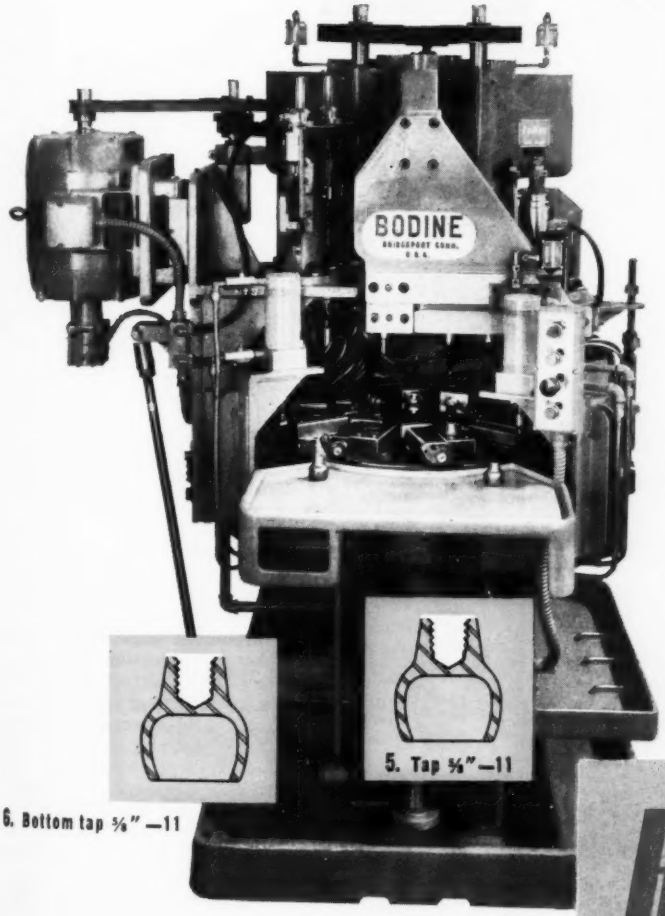
a high production success on a "heavy duty" job

Here's an interesting example of how the "extra capacity" built into a Bodine machine can sometimes be put to work very profitably. Ordinarily, ½" drill and tap capacity in steel is maximum for the Bodine 48-30, but in this case we are successfully handling 17/32" drills and ⅝"—11 taps in an SAE 1025 steel forging on a high production schedule.

Bodine Basic design provides the ample rigidity and mounting space requirements for separate high-power drill and tap spindle drives. Special centralizing clamping fixtures take care of the difficult work-holding problem.

Once again, this proves that the best way to approach any difficult production or combined production-assembly problem of this kind is to call Bodine first.

6 operations
600 pieces/
50 min. hr.



1. Spot drill and chamfer

2. Drill 17/32" —¾" deep

3. Bottom drill 17/32" —¾" deep

4. Face top

5. Tap ⅝"—11

6. Bottom tap ⅝" —11

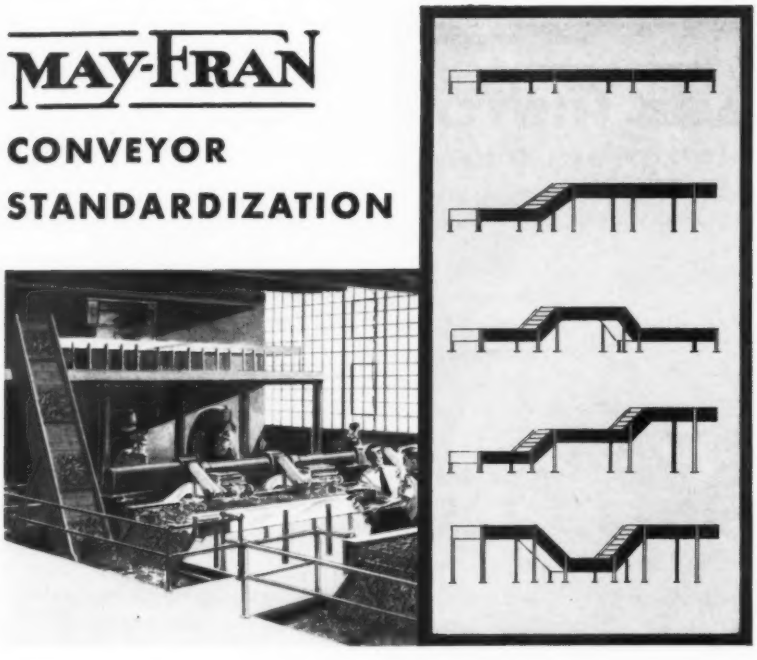
THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Write Dept. TP-3 for further information

CIRCLE INFORM-A-GRAM KEY NO. 35

MAY-FRAN

CONVEYOR STANDARDIZATION



. . . SAVES YOU MONEY

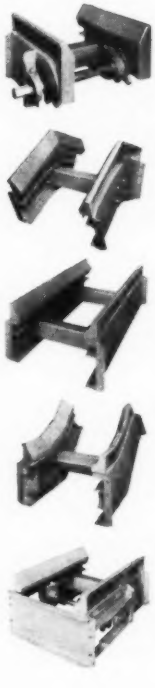
. . . NOW AND IN THE FUTURE!

Here is a conveyor program designed for the unusual. NOW . . . you can have a customized conveyor today to meet production needs . . . and with modification, that same conveyor will meet the needs of tomorrow.

The May-Fran conveyor standardization program provides the standard components that can be assembled to form a special or standard conveyor. These same components can be re-arranged at any time to solve production problems in the future.

In addition, standard components mass produced mean conveyor economy right from the beginning.

Here is a conveyor program of standardization program that saves you money now . . . and in the future!



Write today for your copy of Bulletin MF-200

7320-MF

MAY-FRAN ENGINEERING, INC.

1726 Clarkstone Rd., Cleveland 12, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 36

. . . Month's Talk from page 34

gages, and test sets; and of the in spection procedures and results. It represents a thorough-going review of all factors which have a bearing on product quality. Recommendations are referred to those responsible for the correction of any shortcomings disclosed.

Quality Assurance Benefits The Customer

In Bell Laboratories, we have looked upon Quality Assurance as a program carried on in behalf of the customer. Thus the chairman of each Survey Committee is a quality assurance specialist, independent functionally and organizationally of design, production, or inspection. It is important to minimize the loss of this specialist's objectivity in adapting the survey program to a situation in which there is no such independent Quality Assurance setup. It would appear best, in such circumstances, to have the Committee include representatives of the design, production, and inspection organizations, each with an authoritative status sufficient to guarantee thorough consideration of and any necessary action upon the Committee's recommendations.

Prior to the survey, the Committee, preferably in cooperation with the design engineer, should examine a sample of the product under survey to ascertain to what degree all features of the design intent are reflected in the product. It should review all pertinent quality information as reflected in the inspection information and field performance data, if available. The engineering requirement structure should be examined critically and in detail to determine whether it is clear and complete in all respects.

The effectiveness with which quality and reliability have been built into the design, and reflected by the requirements, should be verified, having in mind the importance of this basic quality groundwork as previously emphasized. The manufacturing information should be reviewed carefully to insure its complete consonance with the engineering requirements.

The inspection gages and test sets should be reviewed for their appropriateness and correct calibration. The adequacy of, and the compliance with the maintenance procedures which apply to them should be verified. The effectiveness and completeness of the inspection procedures should be evaluated in terms of the engineering requirements. The inspection and test results should be checked for their correctness and for their adequacy with respect both to nature and quantity. This quality information should be analyzed and evaluated. Raw materials, purchased components, piece-parts, and assemblies, as well as actual manufactur-

. . . *Continued on Page 38*

CATALOGS ON
TOGGLE CLAMPS
FIXTURE CLAMPS
LEAF JIGS

Only

WESPO

can furnish All the following work-holding devices

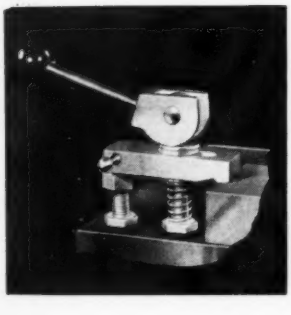
Write for FREE CATALOG!

TOGGLE CLAMPS

Over 39 STYLES and SIZES . . .

NOTE THESE FEATURES:

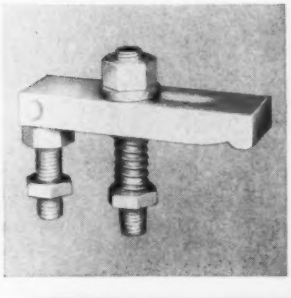
1. Reamed holes—for better bearing.
2. Hardened Bushings, Serrated to prevent turning.
3. High tensile strength rivets—for longer service.



FIXTURE CLAMPS

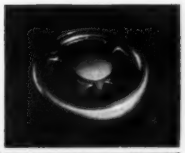
16 STYLES
159 SIZES

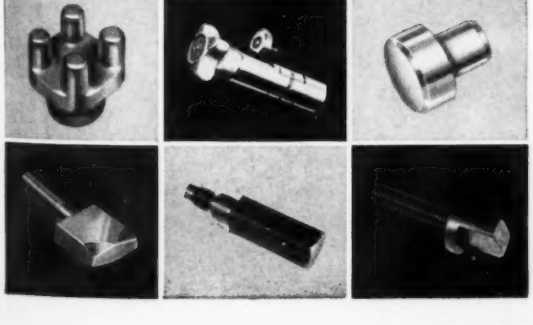
There is a WESPO Clamp Assembly to suit every job.



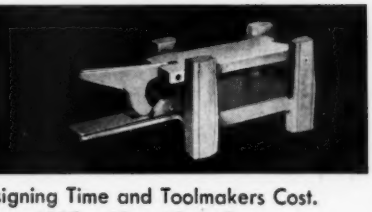
COMPONENTS

Over 1000 different Types and Sizes available from stock

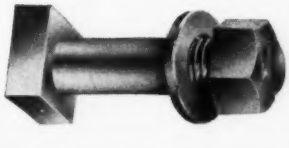




LEAF JIGS



Save 50% Designing Time and Toolmakers Cost.
23 Sizes, 1½" x 2" to 6" x 6".



T-BOLTS AND BOLSTER BOLTS

Made to J.I.C. Press Room Standards.

WEST POINT MFG. CO.

26935 W. 7 MILE ROAD • DETROIT 19, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 37

BARNES ROCKET BLADES CUT CUTTING COSTS

TOUGH!
FLEXIBLE!
SAFE!

ROCKET BLADES
FEATURE
"Gradient Hardness"

FAST—ACCURATE CUTS

Barnes Rocket Blades slice through tough alloy bar stock. Parallelism of the 2 11/16" cuts are held to within .005".

BARNES ROCKET BLADES, made of quality high speed steel, feature *Gradient Hardness. Gradient Hardness* produces hard, sharp teeth backed up by a semi-hard, tough flexible blade. The result is a one piece blade combining peak cutting ability with strength and safety. ROCKET blades will withstand sudden shock loading without breaking or shattering. You are sure of a safe, efficient blade for your toughest sawing jobs.

Call Your Barnes Industrial Distributor
for
BARNES ROCKET
POWER AND HAND
HACK SAW BLADES

WHEN CUTTING COUNTS — COUNT ON BARNES

W. O. BARNES CO., INC.
1297 TERMINAL AVENUE DETROIT 14, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 38

. . . Month's Talk from page 36

ing processes, should be covered.

Any shortcomings which may cause, or tend to cause, quality degradation should be referred for correction to the organizations responsible.

Quality Survey Feeds-Back Data For Design Improvements

Unless the situation is a very unusual one, there will be many engineering changes in the course of introducing a new design. With the extreme order of complexity of some of the new electronic equipment and systems, it is wholly unreasonable to expect the design engineer, however capable and thorough he may be, to foresee and provide against all production difficulties and functional shortcomings. The quality survey affords an excellent feed-back source of information as to the need for design improvements in the light of production and field experience.

The production manager must be receptive to these changes and tolerant of the production delays and difficulties which they cause. To a greater extent than ever before, *reliability is the joint concern of all functional organizations and demands the highest degree of inter-departmental cooperation.*

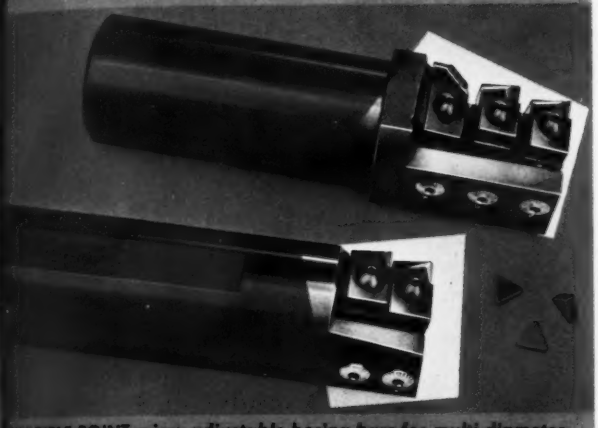
The extent and cost of a quality assurance program will vary widely from product to product. In the final analysis, since there exists no ready formula for determining optimum extent and cost, decisions in this area must be left to judgment. The matter of making judgment decisions is the forte of management people.

Complete information about the Metalworking Industry's newest magazine can be obtained by writing to:

DAN DANIELS
Metlfax Magazine
1975 Lee Rd.
Cleveland 18, Ohio

"Dan" will be glad to send you a copy of Metlfax and any other information you desire about rates, ratings, etc. Write now for your copy!

Wesson micro-adjustable tools for combined BORING AND FACING use throw-aways for both purposes.



MULTIPLE POINT micro-adjustable boring bars for multi-diameter boring and chamfering, etc., have been added to the line. Each insert is micro-adjustable and once set, stays put.

STANDARD MICRO-ADJUSTABLE boring bars are available with interchangeable anvils for different types of inserts, maximum versatility and maximum adaptability to different jobs.

WHAT THEY SAY ABOUT WESSON MICRO-ADJUSTABLE BORING TOOLS

"We've cut boring down-time for tool changes over 90% and cut tool costs from $35 to only 22 cents per 1000 pieces."

"So good, we are now using micro-adjustable boring bars in place of single point turning tools, cutting tool costs, scrap and down-time."

"Micro-adjustable boring bars with throw-aways have cut tool costs on one operation from $13,800 per year to only $1036."

TOOL NEWS

carbide

Revolutionary WESSON tools uncover and cut hidden costs and scrap, improve finish

Micro-Adjustable Boring Bars With Throw-Aways Sweep Industry

Announced barely six months ago, the Wesson line of micro-adjustable boring bars designed specifically for the use of throw-away inserts has taken metalworking by storm, replacing conventional boring tools, reamers, single point tools, and multiple point boring tools in scores of applications. They are even being used for OD turning.

So general has been the acceptance and so broad the demand that the Wesson line of micro-adjustable boring tools has been expanded to a wide range of types, both standard and special. Shown here are just a few of the styles now in use in industry.

Wherever they have been applied they have shown tremendous savings in tool cost, greatly reduced machine down-time for tool changes, and minimized scrap due to boring tool adjustment. Largely contributing to this end are:

MICRO-ADJUSTMENT, an exclusive Wesson feature which provides a positive adjustment for diameter of 0.001 inch for every graduation of the screw-head dial.

ELIMINATES GRINDING of tools. THROW-AWAY inserts permit from 6 to 10 indexes to new cutting edges before discarding the insert.

LOW COST of inserts, greatly reducing outlays for consumption tooling.

(continued on page 2)

Micro-Adjustable Boring Bars

(*Continued from page 1*)

STANDARD PARTS used wherever possible to permit interchange between different boring tools, reduced inventories, etc.

CHIP CONTROL—complete with built-in adjustable chip breaker, making tools equally adaptable to long and short chip work.

LONG LIFE per tool change. In practically every case, pieces per cutting edge are higher than previous tool performance without any change in speeds, feeds or cuts.

A complete new Wesson brochure covering these boring tools has been prepared. Ask for Catalog #MB-157.

Newest No-Skill Grinder

Improved model of Wesson's Poweramic Grinder which automatically produces hone-like tool finishes at low cost in less time. It protects the tools against faulty grinding. Practically no skill is needed. Among the features responsible is Wesson's exclusive Tru-Arc grinding principle. Ask for Bulletin #PG-157.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 JUDGE ROAD, TORONTO 18, ONTARIO

TABLE 1		
	BEFORE	AFTER
Tool used	2-bladed Reamer	Micro-adjustable boring bar
Carbide used	C-6	Wesson WH
Cutting speed, rpm	155	155
Feed rate per revolution	.012 ipr	.012 ipr
Machining time	(cycle unchanged)	
Tool change time	4 minutes	60 seconds
Pieces per tool change	100	400
Pieces per blade or insert, total	400	3200
Grinding cost, each	$0.875	None
Total grinding cost per tool	$3.50	None
Initial tool cost	$11.50	$0.72/insert
Total cost per 1000 pieces	$37.50	$0.22
Total tool change down-time per 1000 pieces	40 minutes	2½ minutes

Throw-Away Boring Tool Gives Better Finish Than Reaming and Cuts Tool Cost 90%

Wesson's micro-adjustable boring bars with square throw-away inserts replaced two-bladed carbide reamers in an automotive transmission plant with the following results, without change in output rate:

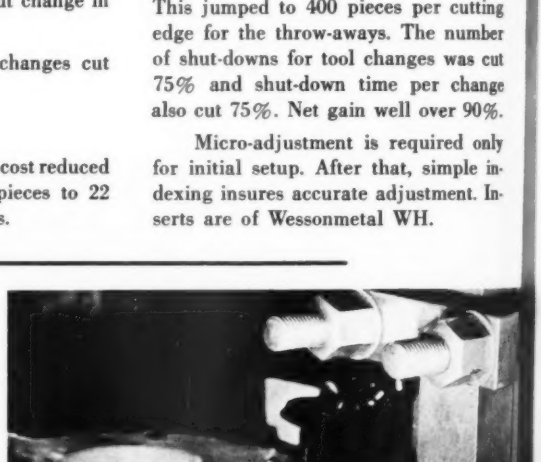
1. Down-time for tool changes cut over 90%.
2. Finish improved.
3. Consumption tooling cost reduced from $35 per 1000 pieces to 22 cents per 1000 pieces.
4. Reduced tool inventory.

The parts are pearlitic planet pinion carrier housings of about 200 Brinell. Reamer output was 100 pieces per grind. This jumped to 400 pieces per cutting edge for the throw-aways. The number of shut-downs for tool changes was cut 75% and shut-down time per change also cut 75%. Net gain well over 90%.

Micro-adjustment is required only for initial setup. After that, simple indexing insures accurate adjustment. Inserts are of Wessonmetal WH.

PLANING WITH "THROW-AWAYS"

The planing operation shown here forecast some years ago that throw-aways were coming. It shows a Wesson MX-9 Multicut holder with a throw-away insert of Wesson's broad-range Grade 26 steel cutting grade, taking a ¾-inch depth of cut without any trouble on mill plate at 200 feet per minute. Planing is another of the big fields served by Wesson "No-Grind" tool holders and indexable inserts. Ask for Catalog #5510-M.



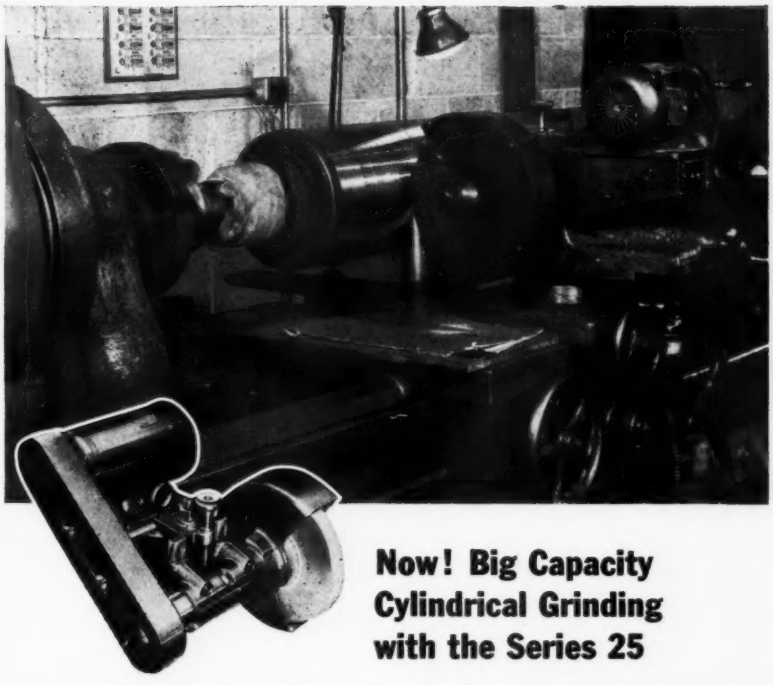
Hand Grinder Speeds Gear Finishing

Making gears of all sizes and shapes is one phase of the business of the Wisconsin Axle Division of Timken-Detroit Axle Co. During manufacture, burrs occur which must be removed for precision gear performance.

This is a painstaking, exacting job which can only be done by hand work. The tool used must have the ability to reach into every nook and tiny corner of the gears. It must be reasonably light in weight, easy-to-handle and have sufficient sustaining power to enable it to be used at day-long intervals, if necessary. Cool operation must also be provided for. Versatility in wheel capacity is another requirement. In short, the tool used should be designed and engineered to provide flexibility in use with a reasonably long life expectancy without excessive maintenance.

To meet these strict requirements, the workmen are equipped with Dumore Hand Grinders. They use these grinders to deburr not only the gears shown, but every big and little gear made by the company. These grinders have repeatedly proved their ability to provide this manufacturer with an efficient, low-cost deburring operation.

The particular hand grinder used is the Dumore Series 10 model. It is recommended for burring, as well as tool and die work, pattern making, production bench grinding, filing and a host of other work. Positive spindle rigidity, forced cooling and quick-change chuck. Universal motor, idles at 22,000 rpm. For further information on this and other Dumore Hand Grinders for high precision grinding at low cost, write to The Dumore Company, 1304 Seventeenth Street, Racine, Wisconsin. ADV.



Now! Big Capacity Cylindrical Grinding with the Series 25

DUMORE TOOL POST GRINDER

MOUNTED ON THE COMPOUND . . . of a 20″ lathe . . . the Series 25 Dumore Tool Post Grinder provides Bird & Son, Charleston, So. Carolina, with an extremely low cost precision cylindrical grinder for refinishing large rollers.

Grinding is necessary to maintain an extremely smooth finish on big steel rollers required in production operations. Formerly, the work was farmed out to the only available supplier. However, lengthy work scheduling by this single source, transportation time delays, and high costs, proved unsatisfactory.

With the Series 25 Dumore Tool Post Grinder mounted on a 20″ lathe, these 12″ diameter, 60″ long rollers are finish ground regularly in their own plant in one eight-hour day, including loading and unloading. This easily obtained, low-cost, precision grinding equipment has now given Bird & Son the advantages of minimum production delays and lower maintenance costs.

With a 3 hp., 3-phase induction type motor, the Series 25 Dumore Tool Post Grinder is the ideal tool for heavy grinding. 12″ wheel capacity. Efficiently hogs away metal or finish grinds. Rugged cast-iron frame assures rigid vibration-free performance. Quill has grease-sealed, lubricated-for-life, precision roller bearings for operation in any position without special oilers. Special patented sealing rings protect bearings during wet or dry grinding.

MOUNTS ON *ANY BASIC* MACHINE TOOL . . . 20″ or larger lathes, planers, shapers, boring mills . . . to provide precision grinding equipment at low cost. Simplified mounting makes change-over quickly.

WARNING: If you own a Dumore Tool Post Grinder — don't let it sit idle in your tool crib! It's the most versatile, useful tool you own. Put it to work **NOW** — you'll save money and get better results!

Tool post grinders are available in other sizes to use on smaller machines for every type of job. Ratings range from 1/4 to 1 hp. For complete details write for Full Line Catalog 55 FL.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

You can do more grinding with Dumore Grinders on any machine tool!

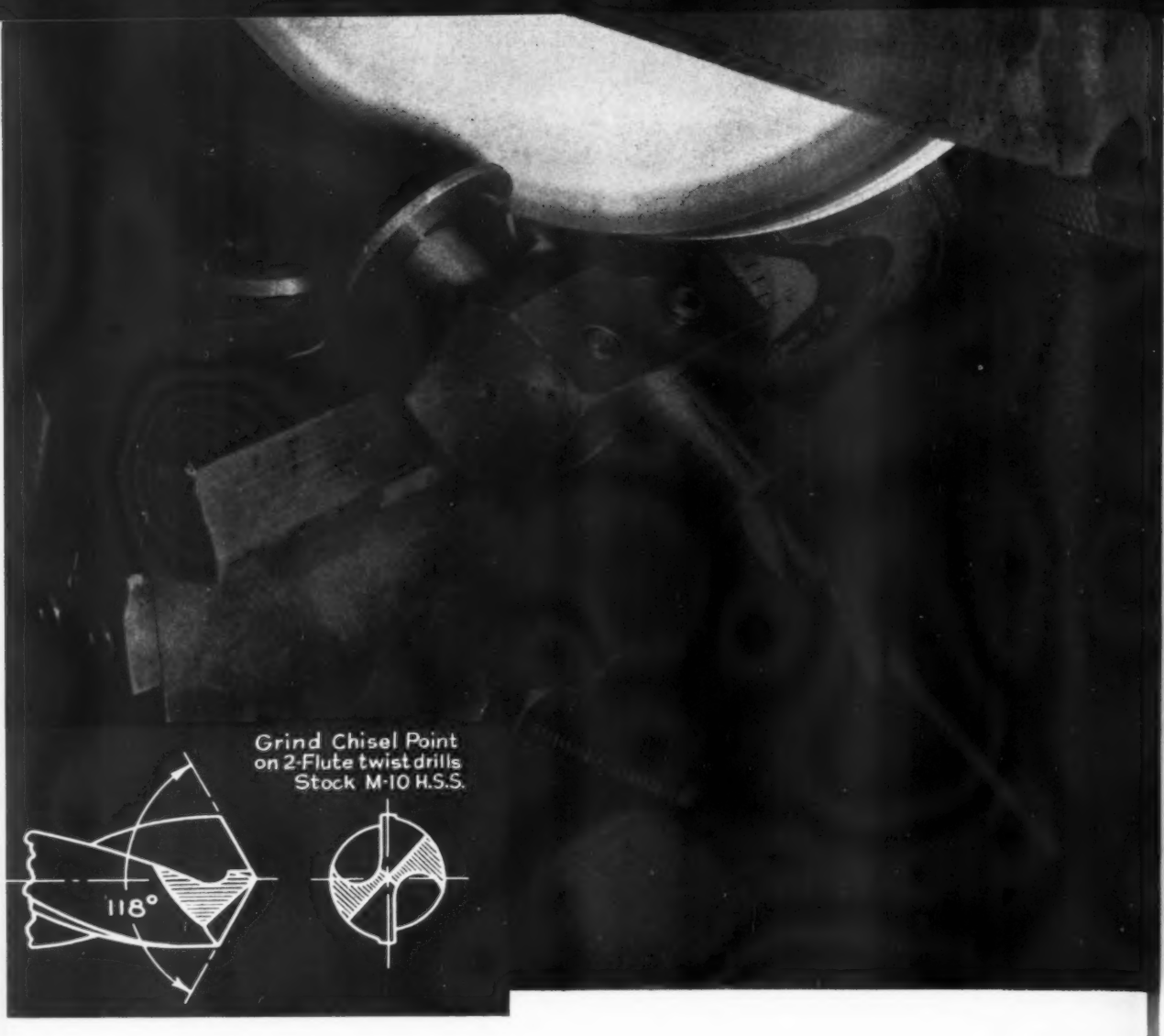
DUMORE

PRECISION TOOLS

1304 Seventeenth St., Racine, Wis.

AUTOMATIC DRILL UNITS
TOOL POST and
HAND GRINDERS

CIRCLE INFORM-A-GRAM KEY NO. 41

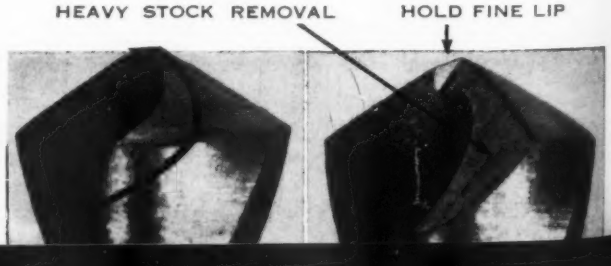


A GRINDING PROGRESS REPORT

Bay State Engineer Finds Way to Triple Production on Chisel Point Grinder

Grinding a "chisel point" on the business end of a twist drill makes it start faster and drill better in hard materials. It's more economical to grind each side of the "chisel" in one cut, as illustrated.

In practice, however, grinding wheels hard enough to hold their corner while cutting the sharp lip, burned the steel in the wide area near the land of the drill. Conversely, wheels soft enough for cool grinding on the land lost their corner rapidly in cutting the lip. In either case, frequent dressing of the wheel was necessary. Because of this, expensive overtime shifts were being worked in an attempt to meet production schedules. Even so, production lagged and rejections were high when Bay State was called in.



Bob Belmont, with 14 years abrasive engineering experience, quickly saw chisel-point grinding as two jobs in one.

Two jobs are done simultaneously with this wheel having two layers of different abrasives. Fine-hard side grinds the drill tip; coarser-softer side makes heavy cut on the land.

Bay State District Manager Bob Belmont saw this drill grinding problem as it really was . . . two distinctly different grinding tasks being done at the same time. To him, here was a natural spot for the "sandwich" wheel, really two wheels in one, with two different layers of abrasives, each having the exact specifications needed for its part of the job. The "specs" worked out for this actual case show the following important differences:

1. The side used for forming the sharp chisel lip has the highly refined 9A (White) Tool Grinding abrasive, a fine grit size (220), and a "hard" bond strength (P grade).

2. The side taking the deep cut on the broad area of the drill land has the less friable 8A abrasive, a relatively coarse grit size (150), and is two full letter grades "softer", (N grade).

With this sandwich wheel, chisel point production rose three times and even more, depending on drill size. In every case, this was more than enough to keep production going smoothly *without* overtime, and with excellent quality of points.

The job had been a production headache because of just one thing . . . it needed the trained abrasive engineering viewpoint to recognize the dual nature of the job . . . and make it work! This type of alert engineering can be skillfully applied to *your* grinding. Simply call in your local Bay State Distributor, or write directly to Bay State Abrasive Products Co., Westboro, Massachusetts.

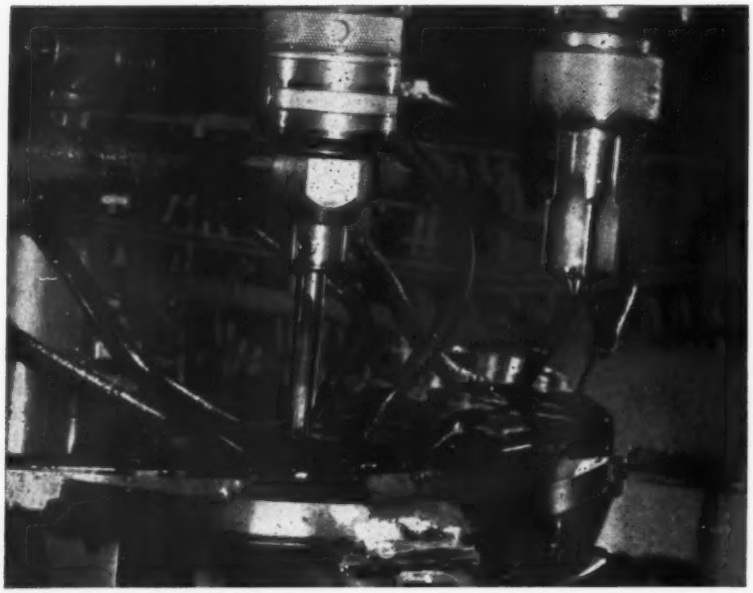
Branch Offices are located in Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; with distributors in all principal cities.

In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ont.

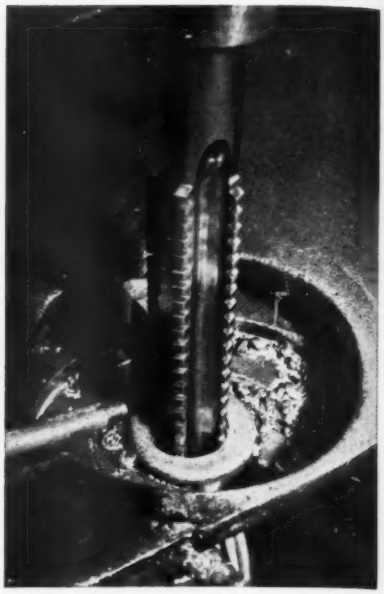
BAY STATE ®
WHEELS of PROGRESS

CIRCLE INFORM-A-GRAM KEY NO. 43

Cutting Tool and Gaging Methods . . . by BESLY

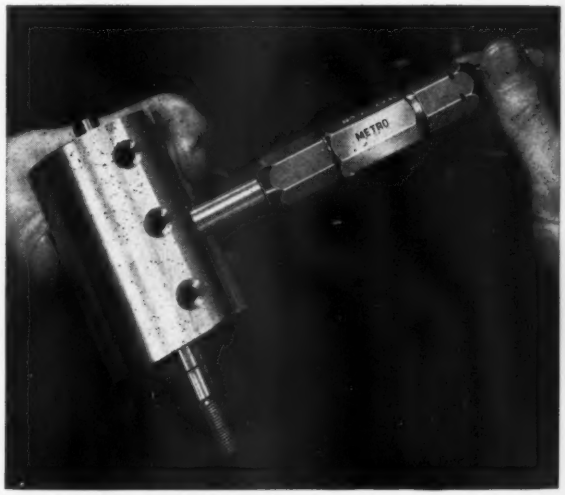


MATCHED TO THE JOB — At The Chicago Screw Company, Bellwood, Illinois, two sizes of Besly taps, poised above an indexing table, are ready to tap C-1141 steel parts. Operating alternately, the smaller ⅜"-24 Besly tap quickly threads a hole, then the work indexes beneath the 1 3/32"-24 Besly tap and a larger hole is threaded. By using Besly's Engineering Service, this company realized lower costs and a better job. The right taps were carefully selected and matched to the specific threading requirements.



SQUARED OFF — Templeton, Kenly & Company, Broadview, Ill. cuts heavy, almost square threads in malleable iron bases of rugged 12 to 24-ton screw jacks with Besly acme thread form Taps. Notice mirror finish on flutes promoting greater chip clearance.

TOUGH GOING — Here you see a C-1018 high carbon steel nut being threaded by a Besly 1¾" tap. Extremely abrasive, because it has been carburized and heat treated, the material is difficult to tap. However, Besly taps tested on the work, proved they could "take it" and were specified by this manufacturer for the job.



ASSURED ACCURACY — To assure that holes in planer cutter head assemblies provide precise fits for set screws, SKIL Corporation, Chicago, checks for accuracy with Besly-Metro Double End Reversible Cylindrical Plug Gages. Two opposed blades have three holding set-screws and another for adjusting position.

Prove to yourself that Besly Cutting Tools and Gages produce better results. Put them on trial on your toughest jobs, and check the difference in longer tool life, less down time, fewer rejects and faster production. If you'd like to try Besly tools or use Besly's Engineering Service, see your Besly distributor for details, or write us . . .

Engineering, Service and "Specials" . . . are a Besly Specialty

BESLY

BESLY-WELLES
CORPORATION
Est. as C. H. Besly & Co. 1875
128 Dearborn Avenue
South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES
CARBIDE TIPPED TOOLS, BLANKS, THROWAWAY INSERTS and HOLDERS

CIRCLE INFORM-A-GRAM KEY NO. 44

don't overlook this way to save on your production costs

OK aluminum bronze wear plates for cam dies are now being used by the majority of appliance builders and automotive body makers. Here's why: You save approximately 40% under the cost of expensive solid bronze wear plates...and you receive completely finished wear plates, available from stock, ground to ± .0005 parallel and flat. By a unique cladding process, long wearing aluminum bronze is bonded to a steel base, easily machinable for fitting to dies.

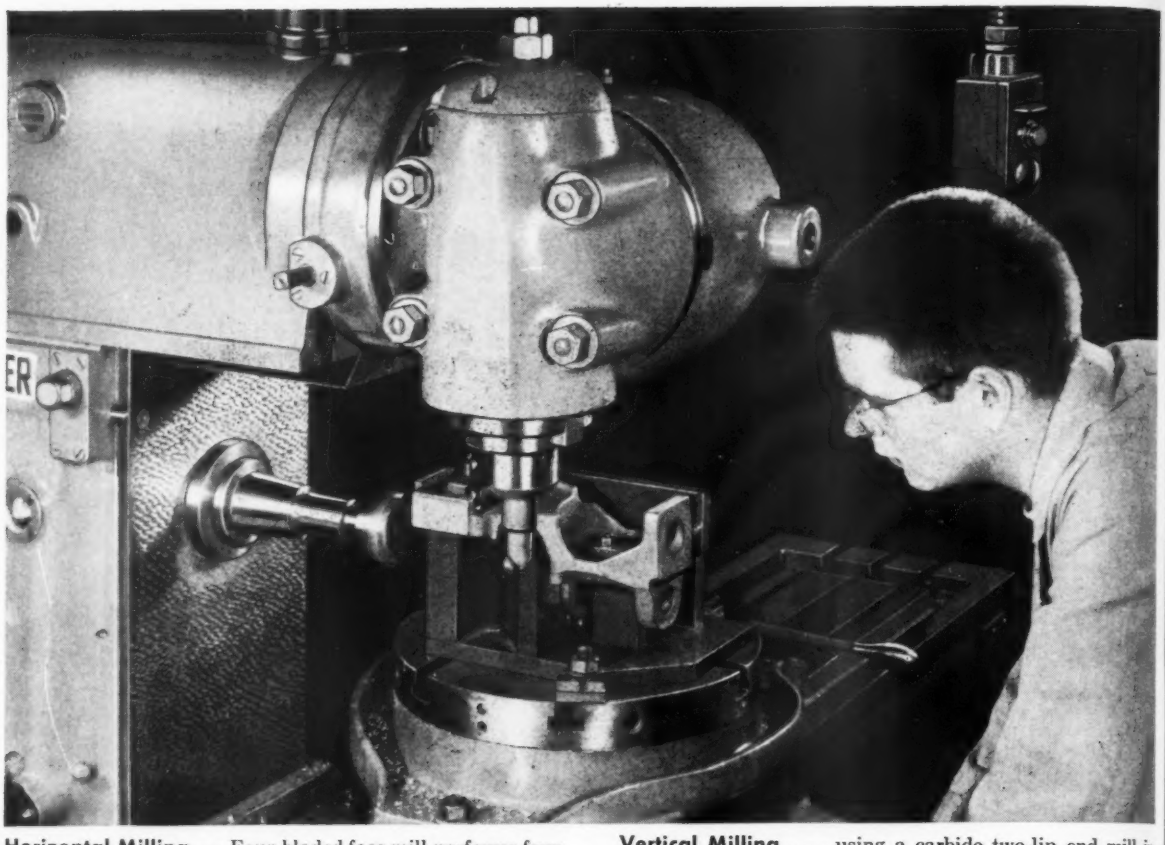
Drilling or counterboring can be done through bronze surface if required. Wherever your die has a sliding or cam action, you'll achieve finer results with OK aluminum bronze wear plates. Complete information is contained in our new OK Catalog. For your free copy, write Dept. 57-LL.

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

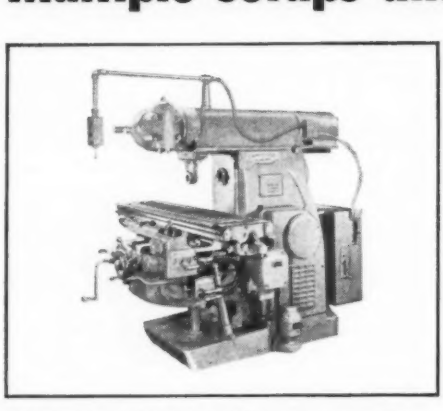
CIRCLE INFORM-A-GRAM KEY NO. 45



Horizontal Milling . . . Four-bladed face mill performs four horizontal milling operations on magnesium casting. Simple fixture on rotary table holds workpiece. Four milling positions accomplished through indexing of rotary table.

Vertical Milling . . . using a carbide two-lip end mill in the ram head spindle, three vertical milling operations are completed without disturbing the setup. Rotary table is used for indexing the workpiece.

Multiple setups and excessive handling eliminated



10hp No. 3 Model CH, Plain style Ram Head milling machine with Mono-Lever and Automatic Cycle Table Control and Type U Universal Head.

Kearney & Trecker Ram Head Milling Machine completes seven operations without removing workpiece

Kearney & Trecker's new line of Ram Head milling machines combines a conventional horizontal spindle and a self-contained motorized sliding ram. As a result, horizontal and vertical spindles can be run separately and simultaneously.

The Ram Head machines are available with a choice of three heads—Universal, Vertical and Quill types which can be rotated through 360°. You can perform vertical, horizontal and angular milling on one machine *in a single setup.* They are built in No's. 2, 3, and 4 sizes in both plain and universal styles. Plain machines may be optionally equipped with Mono-Lever and Automatic Cycle Table Control.

For the full story, contact your nearest Kearney & Trecker representative, or write Kearney & Trecker Corp., 6776 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE

Designers and Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 46

ATLANTA, GA.
Scott Machine Tool Co.
411 Williams St., N.W.

BIRMINGHAM, ALA.
George M. Meriwether Industrial Equipment
1712 Seventh Ave. North

BOSTON, MASS.
Stedfast & Roulston, Inc.
11 Deerfield St.

BUFFALO 23, N.Y.
Syracuse Supply Co.
1965 Sheridan Drive

CHARLESTON, W. VA.
Wm. S. Bolden Co., Inc.
MacCorkle Ave.

CHATTANOOGA, TENN.
Scott Machine Tool Co.

CHICAGO, ILL.
Jackson-Fotsch Co.
7350 West Lawrence Ave.

CINCINNATI, O.
The E. A. Kinsey Co.
327-335 W. Fourth St.

NEW YORK, N. Y.
Kearney & Trecker Corp.
409 Grand Ave.
Englewood, New Jersey

NEW ORLEANS, LA.
Stauss & Haas, Inc.
524 Camp St.

OMAHA, NEB.
Fuchs Mach. & Supply Co.
2401 N. Eleventh St.

PHILADELPHIA, PENN.
Machinery Assoc., Inc.
325 E. Lancaster Ave.
Wynnewood, Penna.

PITTSBURGH, PENN.
Kearney & Trecker Corp.
4 West Manilla Ave.

PORTLAND, ORE.
Harry M. Euler Co.
2811 N.E. Gilsan St.

RICHMOND, VA.
Smith-Courtney Co.
Seventh & Bainbridge Sts.

For details, contact these
KEARNEY & TRECKER DISTRIBUTORS
or write to
KEARNEY & TRECKER CORP.
6776 W National Ave., Milwaukee 14, Wis.

CLEVELAND, O.
Kearney & Trecker Corp.
Euclid Ave. & E. 17th St.

COLUMBUS, O.
The E. A. Kinsey Co.
1020 W. Fifth St.

DALLAS, TEX.
Greene Machinery Co.
6300 Wyche Blvd.

DAYTON, O.
The E.A. Kinsey Co.
16 Washington St.

DENVER, COLO.
F. J. Leonard Co.
1219 California St.

DETROIT, MICH.
Kearney & Trecker Corp.
10600 Puritan Ave.

GREENSBORO, N. C.
Smith-Courtney Co.
239 S. Davie St.

HICKORY, N. C.
Smith-Courtney Co.
103 3rd Street, S.W.

HOUSTON, TEX.
Steel & Machine Tool Sales
6414 Navigation Blvd.

INDIANAPOLIS, IND.
The E. A. Kinsey Co.
1550 Stadium Drive

KANSAS CITY, MO.
Blackman & Nuetzel Machinery Co.
1103 E. Armour Blvd.

LOS ANGELES, CALIF.
Moore Machinery Co.
3200 S. Garfield Ave.

MILWAUKEE, WIS.
Kearney & Trecker Corp.
6784 W. National Ave.

ROCHESTER 4, N. Y.
Syracuse Supply Co.
311 Alexander Street

ST. LOUIS, MO.
Blackman & Nuetzel Machinery Co.
3713 Washington Ave.

ST. PAUL, MINN.
Sales Serv. Mach. Tool Co.
2363 University Ave.

SALT LAKE CITY, UTAH
Todd Machinery Co.
4165 Holloway Drive

SAN FRANCISCO, CAL.
Moore Machinery Co.
7th & Carleton-Berkeley

SAN JOSE, CALIF.
Moore Machinery Co.
656 Stockton Ave.

SEATTLE, WASH.
Dawson Mach. Co.
5700 First Ave., S.

SHREVEPORT, LA.
Peerless Supply Co., Inc.
701 Spring St.

SYRACUSE 1, N. Y.
Syracuse Supply Co.
314-332 W. Fayette St.

TULSA, OKLA.
White Star Mach. Co.
104 Boulder Bldg.
19 West 10th Street

WICHITA, KAN.
White Star Mach. Co.
301 N. St. Francis

CANADA
MONTREAL
OTTAWA
QUEBEC
TORONTO
WINDSOR
Williams & Wilson Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 46

STRENGTHENING SUPERVISORY AND EXECUTIVE PERFORMANCE. Personnel Series 167, published by the American Management Association, 1515 Broadway, New York 36, N. Y., 1956. 63 pages, $1.75 $1 to AMA members).

Top executives report on their companies' actual experience in strengthening supervisory and executive performance for future operations. For instance, a report by Roy C. Ingersoll, chairman of the board of Borg-Warner Corporation, on the necessity for analyzing management's role in our economy with greater depth; one by T. W. Prior, director of training at Goodyear Tire & Rubber Company on his company's program of executive apprenticeship; and another by E. H. Reed, manager of the education and personnel department of International Harvester Company on I-H's practical plan for executive development.

Dr. Ralph T. Collins, psychiatrist of Eastman Kodak Company, offers a perceptive appraisal of executive life—its functions, problems, and hazards — and another report discusses integrity in business and its implications for management.

DEFECTS OF IMPORTANCE IN THE SPECIFICATION OF REINFORCED PLASTIC PRODUCTS, by F. R. Barnet, Naval Ordnance Laboratory, March 1953. Report PB 121277, available from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. 53 pages, $1.50.

A guide to the specification of quality and workmanship in laminated plastic materials procured for military use, this report identifies common defects which appear in polyester type resins (MIL-R-7575) and polyester-glass cloth-glass mat laminated plastic (MIL-P-8013). Used to supplement military specifications, the data provide exacting standards for procurement of quality materials. Such primary flaws in laminates as air and gas bubbles, crazing, patches, and delaminations are illustrated and discussed in terms of their effects under various conditions of use. An appendix lists allowable flaws under typical service conditions.

. . . *Continued on Page 48*

Toolmakers' microscope reads to 0.0001" and 1 minute of arc. Co-ordinate range 4" x 2". Compact built-in rotary stage.

Make precise measurements to 0.0001" and cut rejects with Gaertner microscopes

Here are reliable, easy-to-use microscopes for precise, indisputable measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. With these instruments you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear.

Through the engineering facilities at our Chicago plant, these versatile, well-constructed microscopes can be adapted to meet your exact needs. Find out now how you can gain new production savings with Gaertner measuring microscopes.

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Scale Micrometer or Shop Microscope

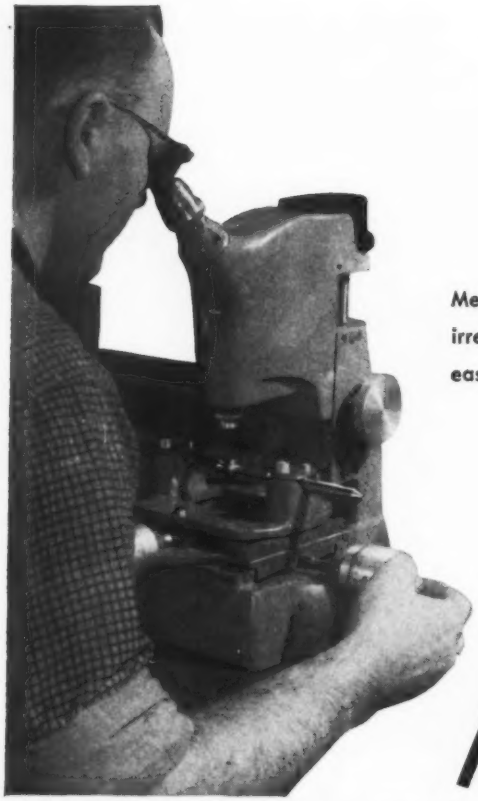
High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".

Write for Bulletin 161-54

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 47



Measures tiniest parts, irregular shapes . . . faster, easier, at a budget price

NEW

Bausch & Lomb TOOLMAKERS' MEASURING MICROSCOPE

EXCLUSIVE! Fast, easy adjustment aligns crosshairs of eyepiece with x-y motion of stage for absolute precision of measurement.

TRULY VERTICAL illumination for study of deep cavities. Built-in illuminator provides ample, comfortable light for full-working-day use.

PROTRACTOR EYEPIECE (optional) is quickly, easily interchangeable with standard eyepiece; speeds accurate measurement of angles.

All the features that most toolmakers need are efficiently combined in this sturdy, new precision-measurement instrument . . . at only $1200 for the complete basic equipment. Massive controls, conveniently grouped, assure steady, sharp focus on parts up to 2½" in any dimension. Direct readings to 0.0001"; angular, to 1' of arc. 2"x1" travel accommodates wide range of work. Precision-ground centers (optional). Optically, mechanically, this new, low-cost microscope makes it easier to work to closer tolerances of precision. See for yourself in a free demonstration.

BAUSCH & LOMB OPTICAL CO.
79815 St. Paul Street, Rochester 2, N. Y.

☐ Send me informative new B&L Toolmakers' Microscope Catalog D-282

☐ I would like an obligation-free demonstration of the new B&L Toolmakers' Microscope

Name, Title.....

Company.....

Address.....

City..... Zone..... State.....

CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Book Reviews from Page 47

OPERATIONS RESEARCH: A BASIC APPROACH. Special Report No. 13, published by the American Management Association, 1515 Broadway, New York 36, N. Y., 1956. 111 pages, $3.75 ($2.50 to AMA members).

This AMA report discusses operations research without excessive dependence on mathematical formulas. Thus it gives the non-specialist an opportunity to explore OR potentialities. By showing the applications of OR techniques in a number of industries, it gives the typical operating executive a good introduction to this technical subject.

The report is made up of a number of papers presented originally at an AMA seminar. From the beginning paper, which defines the terms used, describes the method, and points to some problem areas in OR; to the last paper, which looks ahead to new developments and applications, the study should be a welcome aid to management.

BUSINESS FORECASTING IN PRACTICE, edited by Adolph G. Abramson and Russell H. Mack. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1956. 275 pages, $6.50.

This practical treatment of modern business forecasting accomplishes two objectives: It presents specific information on how forecasts are prepared, showing techniques forecasters use; and it shows how existing studies of business cycles can be used more fully by forecasters. Chief emphasis is on short-term forecasting.

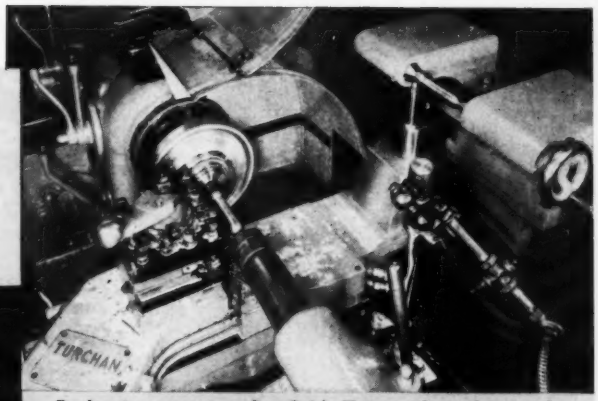
Following chapters on business cycle theories and general forecasting techniques, six experienced forecasters show which facts they use, how they interpret and evaluate them, and how they reach conclusions. Donald J. Watson, a General Electric Co. economist is one of the contributors.

Metlfax Magazine Is Now Available To Readers and Advertisers in the Metalworking Field

Write: "Dan" Daniels
1975 Lee Road
Cleveland 18, Ohio
For Complete Details

Turchan HYDRAULIC TRACER CONTROLS

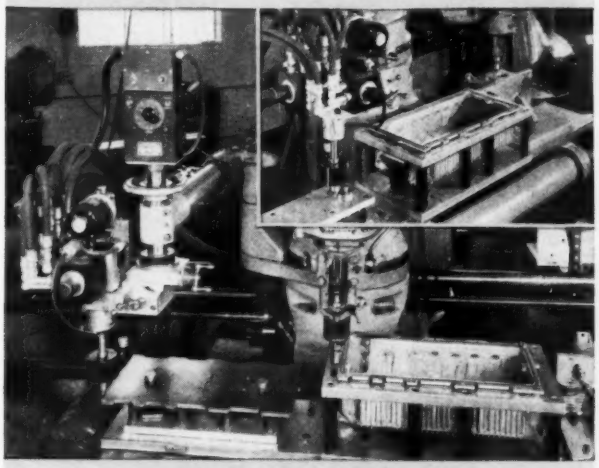
THE SIMPLEST SYSTEM OF MORE PROFITABLE PRODUCTION



Turchan tracers assure a finer finish. The smooth, continuous advance of the carriage by power feed, coupled with the floating action of the angular tool slide, produces a turned surface of unsurpassed smoothness. In many instances final grinding is unnecessary.

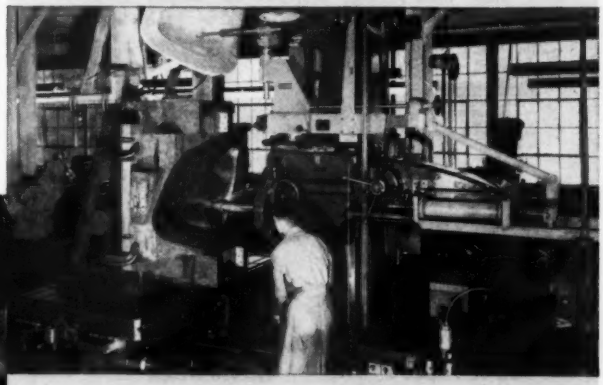
TURNING
MILLING
BORING
PLANING
SHAPING

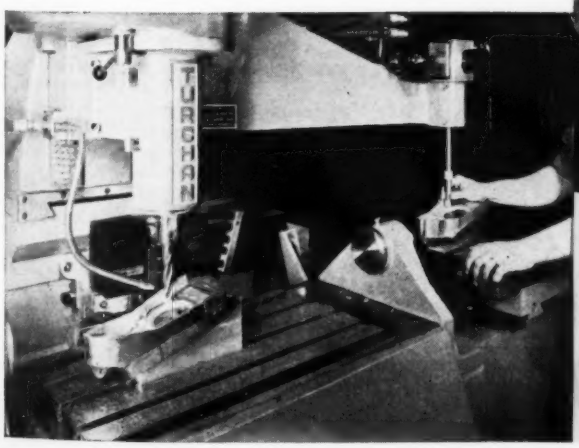
Machine tools equipped with Turchan tracer controls handle a greater variety of work faster and more accurately. Standard operation of the machine is possible by a simple switching mechanism which converts the machine quickly from straight work to intricate profiling and contouring and back again.



Complicated work requiring contouring, grooving and profiling are handled easily with Turchan Tracer control. In most cases many extra operations are reduced to one set-up.

TURCHAN
FOLLOWER MACHINE CO.
8259 LIVERNOIS • DETROIT 4, MICH.



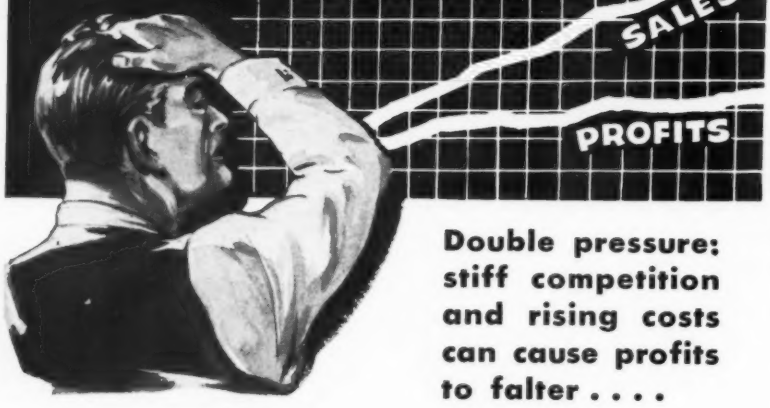


Turchan units are supplied complete. Installation is very simple and all installations are supervised by a Turchan engineer.

Write today for your Turchan Folders. If you have a production problem Turchan has the solution.

CIRCLE INFORM-A-GRAM KEY NO. 49

Are your Sales and Profits Lines ? *Parting Company*



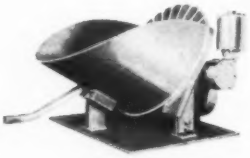
Double pressure: stiff competition and rising costs can cause profits to falter . . . .

DPS POWER ASSEMBLING METHODS will help sustain *THAT PROFITS LINE!*

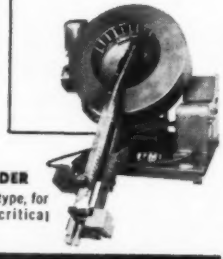
• Though profits may continue to move upward under present conditions, profit increases may not match sales advances. Here is where DPS methods with their time-saving, stepped-up output and lower costs can meet the situation effectively. Results in progressive plants everywhere prove it. Plan now to put more profit into your feeding and assembling operations. DPS POWER SCREWDRIVERS and SELECTIVE PARTS FEEDERS will do it. Write us, give details. We'll send catalog and recommendations.

SCREWDRIVING MACHINES
Bench and Pedestal Types
5 Models

BOWL FEEDER
Electrical vibratory type to feed parts that cannot be tumbled.



BARREL FEEDER
with stationary ring cover for heavy-duty production.



BARREL FEEDER
Popular motorized type, for parts requiring critical selection.

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 50

"Commendable Comments"

"The most effective way to develop responsible administrators is through the performance of the day-to-day requirements of the job. Essentially and simply, people learn by doing. The extent of their learning and the speed with which they learn depend in a large part upon the immediate superior to whom the subordinates are responsible."

—Dr. Myles L. Mace, vice president, Litton Industries, Inc., at the West Coast General Management Conference of the American Management.

"Diamonds are just as important for defense tooling as uranium is for nuclear energy! . . . this hardest known natural substance will be used with increasing effectiveness in modern industry."

—Karl J. Klapka, sales manager, Truco Swivel Division, Wheel Trueing Tool Co., at a Detroit American Welding Society meeting.

"No business is successful by chance. It requires planning to make it that way. Too often small companies are apt to brush off the idea of planning for the future . . . because they are not large enough to engage personnel for this work. Even a one-man business would not be successful for long, if it lived and made decisions for today only."

—Charles A. Jurgenson, vice president of manufacturing, DeLaval Steam Turbine Co., at the West Coast General Management Conference of the American Management Association.

"Trained manpower — brainpower, if you will — is the principal source of our wealth. With no more than their share of the world's materials to work with, our trained men have built the richest, the most productive country on earth. And they have accomplished this task without compulsion, moved not by fear or government edict, but by the incentive of personal reward. This is the essence of the free enterprise system."

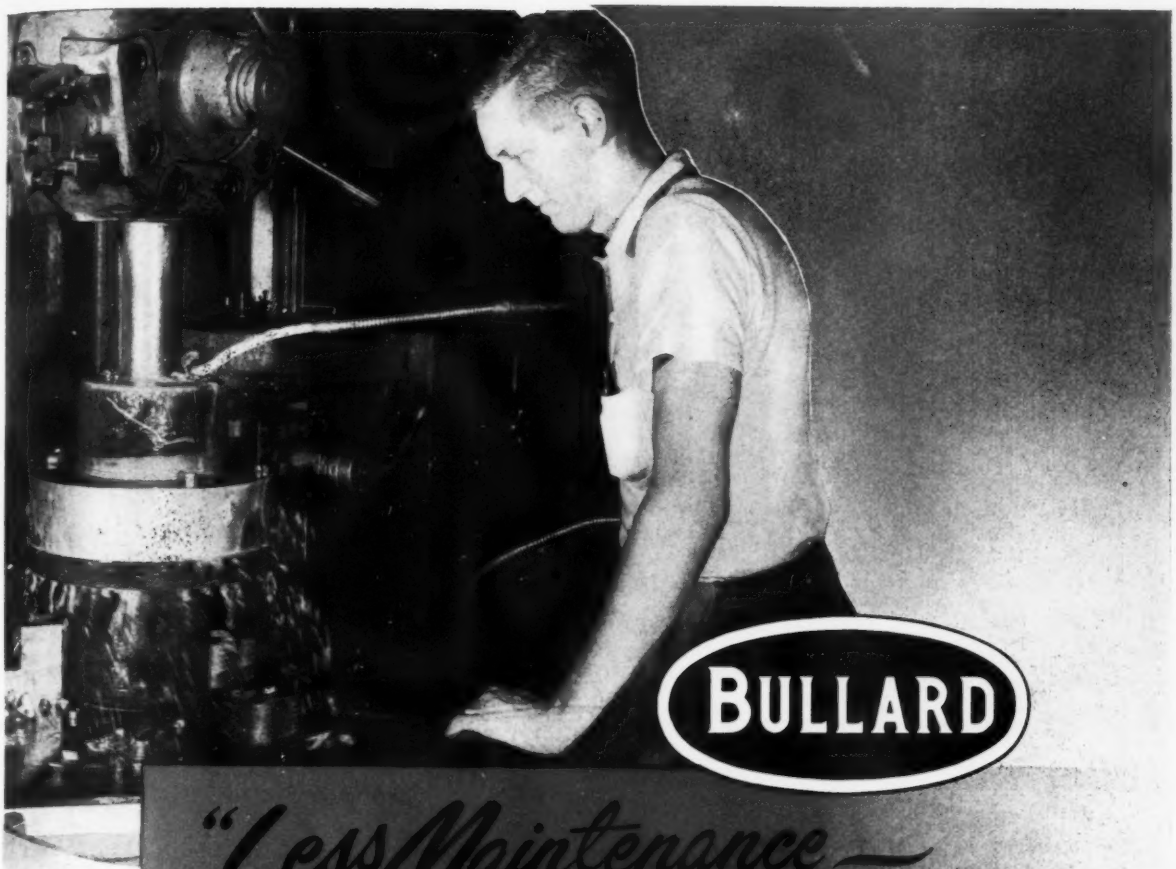
—C. M. White, chairman, Republic Steel Corp., before the American Society for Metals.

". . . we in industry must not stand by and expect the educational system to carry the burden of expanding the educational system alone. We must assume the responsibility for training a larger percentage of the skilled workers needed in our plants."

—T. F. Patton, president, Republic Steel Corp., at the Northern Ohio Personnel & Executive Conference.

"It is high time we recognized that support of our educational system and especially in the scientific and engineering fields must be a matter of national industrial policy."

—Dr. John R. Dunning, dean, School of Engineering, Columbia University, at the 61st Congress of American Industry, National Association of Manufacturers.



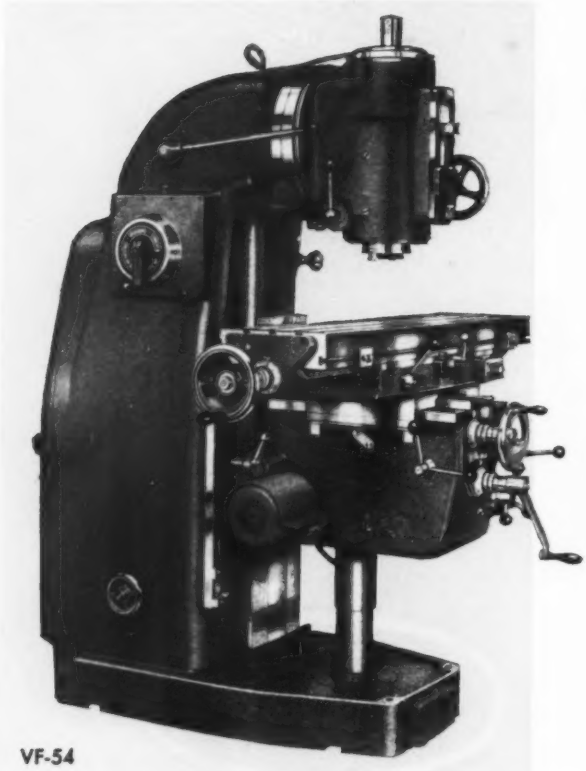
"Less Maintenance—Less Down Time Increased our Production"

This statement by Methods Supervisor Raymond Hoss of the Ingersoll Milling Machine Company of Rockford, Illinois summarizes one of the benefits they received from the purchase of a 36" Cut Master V.T.L., Model 75. Less operator fatigue, higher speeds, power chucking and power indexing turret are other factors which increase the overall production obtained with Bullard Cut Master, Model 75.

These same benefits can be applied to your production problems—just call your nearest Bullard Sales Engineer—he'll be glad to help—or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 51



VF-54

ONLY SWEDISH CRAFTSMEN

Can Build These Precision Millers At Such Surprisingly Low Cost

HORIZONTAL AND VERTICAL SAJO MILLERS

Built to U.S. Standards, Sajo Millers with proven production records in modern industry are available in both plain and universal models. Installation references in your vicinity on request.

Standard Duty #2 (Model 54)
ALL GEARED Millers—

Plain, Universal and Vertical—table 52" x 11", 7½ HP with power feeds (longitudinal 33½") and power rapid traverse.

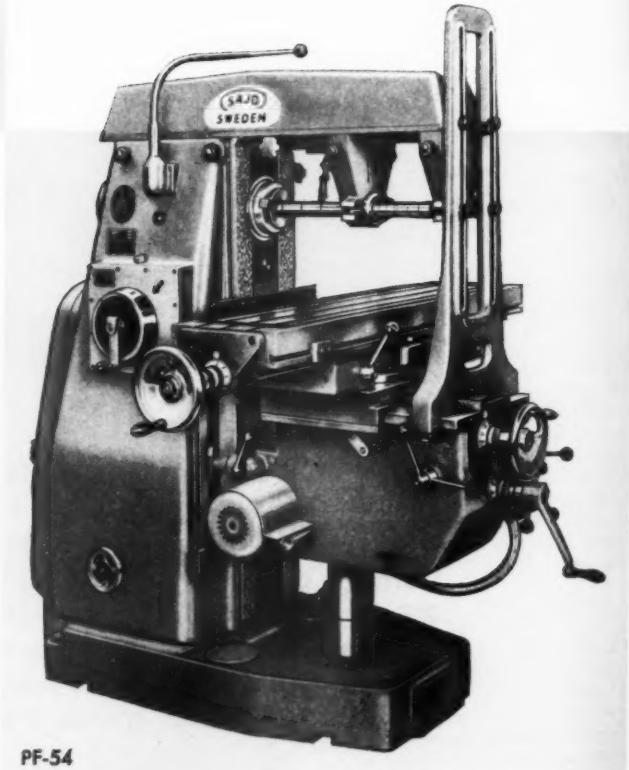
•

Light Duty #2 (Model 53)
ALL GEARED Millers—

Plain and Universal—table 41⅜" x 9¼" —3½ HP with power feeds (longitudinal 24½").

Light Duty #2 (Model 48)
Utility Millers—

Plain and Universal—table 41⅜" x 9¼" —3½ HP with power feeds (longitudinal 24½").



PF-54

austin INDUSTRIAL CORPORATION
76-X MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

HORIZONTAL AND VERTICAL SHAPERS • POWER HACKSAWS

FAST SERVICE AND PARTS AVAILABLE FROM MAJOR CITIES, WRITE FOR CATALOGS

CIRCLE INFORM-A-GRAM KEY NO. 52

eliminate "cut and try" with Microbore...

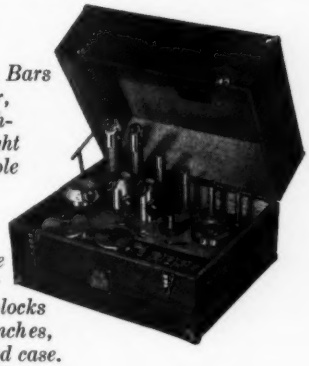
...THE TOOL THAT ADJUSTS IN SECONDS!

YES, EVERY TIME—ALL THE TIME! In seconds, with our proven micrometer vernier adjustment, any operator who can read a "mike" can adjust a Microbore Tool for precision boring to extremely close tolerances.

Any production man knows what that means. Elimination of wasteful down time. Greater productivity of men and machines. Fewer rejects. Better parts due to holding closer tolerances.

It just makes good sense to *Modernize with Microbore.* A few dollars so invested can increase the productivity of a machine costing thousands.

Microbore units can also be applied in clusters for special tooling designed for high production applications.



A wide range of Microbore Boring Bars with NMTB taper, Morse taper, Flash-Change and Straight Shanks are available singly or in complete sets. Standard set includes Microbore units for each tool station, grinding blocks and necessary wrenches, in a fitted hardwood case.

As the first step in eliminating your own costly "cut and try" methods, write for Microbore Catalog No. 56.

DeVlieg Microbore System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 53

COVEL SURFACE GRINDERS

When you choose a Covel Grinder you can select the machine that fits your needs *exactly*. No need to buy more machine than you want or cramp your style by buying a machine with smaller capacity than you need. Covel offers you the widest choice in the industry for surface grinders ranging in capacity from 6" x 12" to 14" x 24".

You'll be pleased with Covel's many original, exclusive and superior features that make for greater speed and ease of operation, and increased long-lived accuracy. Covel's outstanding engineering is the result of experience gained in more than eighty years of building Precision Surface Grinders.

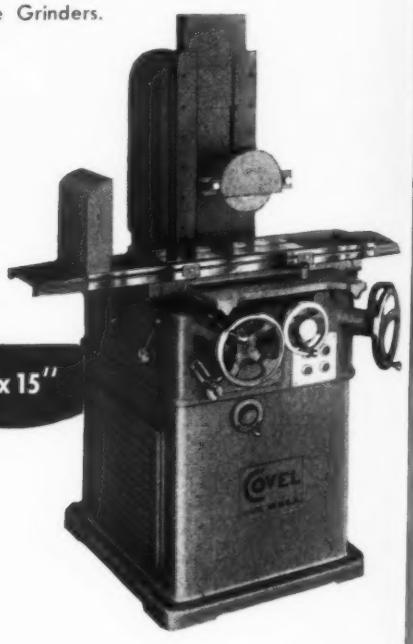
No. 17 10"x16"x14"

WRITE FOR BULLETIN T37-17

HAND FEED SURFACE GRINDER

If you're looking for large capacity at the lowest possible cost, this Covel precision grinder will fill the bill. Will grind work 10" x 16" x 14" high under a 12" grinding wheel. Longitudinal table travel 17½"; transverse table travel 11½".

- Elevating handwheel below table level.
- Timing belt drive to table.
- Hardened and ground lead screws.
- 12" wheel direct driven by 2 HP motor.
- Large dia. handwheel moves table full 6" per turn.
- Precision ball-bearing spindle.



No. 10 6"x18"x15"

No. 7A 6"x12"x11¼"

HAND FEED SURFACE GRINDER

Ideal for grinding tools, dies, chip breakers, thread chasers and general tool room surface grinding within its capacity. Rugged enough for production jobs. Will grind work 6" x 12" x 11¼" under 7" grinding wheel. Accommodates any 5" x 10" or 6" x 12" magnetic chuck.

- Elevating handwheel *below* table level.
- Precision hand-scraped ways.
- Timing belt drive to table.
- Sealed-for-life ball-bearing spindle.
- Precision ground feed screws.
- Extra engineered weight in base and column.

Write For Bulletin T37-7A

HAND OR POWER FEED SURFACE GRINDER

A low-cost, precision machine. Rugged construction with easy operation provide precision gage and form tool work as well as surface grinding. Will grind work 6" x 18" x 15" high under a 7" grinding wheel. Longitudinal table travel 20"; transverse table travel 7".

- Precision hand-scraped ways.
- Massive, well-proportioned spindle head and base castings.
- Timing belt drive to table.
- Anti-friction ball and roller bearings throughout.
- Hardened and precision ground feed screws.

Write For Bulletin T37-10

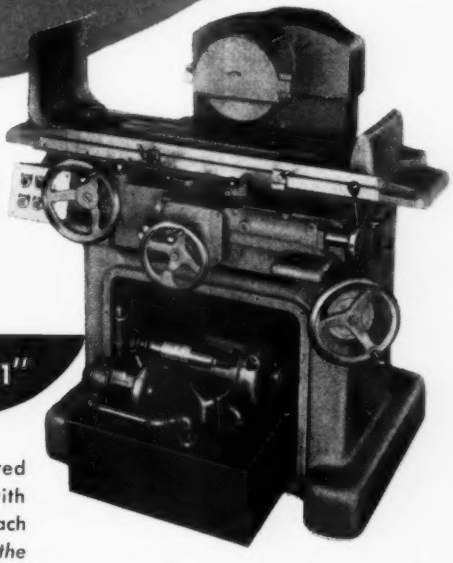
Choose from the

MOST COMPLETE LINE

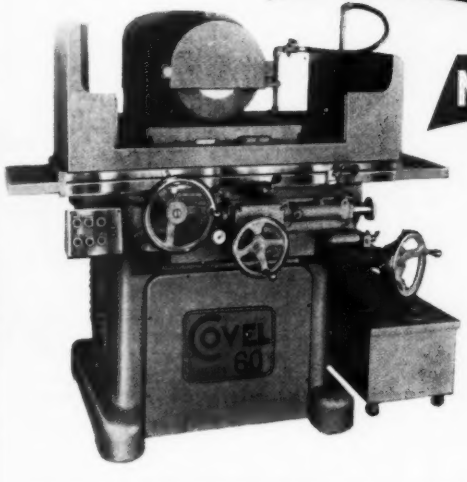
7 Models up to 14" x 24"

HYDRAULIC SURFACE GRINDERS

No. 60 14" x 24" x 15"



No. 35A 8" x 24" x 11"



Proven, Covel-engineered features combined with Covel's guarantee of each machine *after it is in the field* make the Covel "35A" and "60" ideal for a wide variety of precision work. The heavy construction offers rigidity necessary for fast, efficient stock removal. Built in Covel-engineered accuracy assures faster, more accurate work at lower cost. Both No. 35A and No. 60 have fully automatic hydraulic wheel truing device, another Covel *first*, introduced by Covel at the 1955 Machine Tool Show.

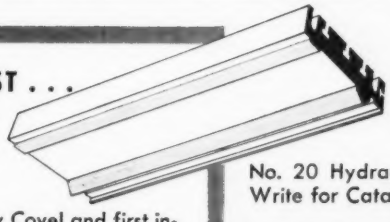
	No. 35A	No. 60
Work Capacity	8" x 24" x 11"	14" x 24" x 15"
Grinding Wheel	12" x ¾" x 3"	14" x 1" x 3"
Spindle Motor HP	2	3
Write For Catalog	*T-37-35*	*T-37-60*

Here are a few of the many Covel features:

- New hydraulic rapid traverse with self-contained sealed hydraulic system.
- Greater width of ways for maximum stability.
- Elevating handwheel below table level.
- Hand-scraped vertical ways cast integral with base.
- Hardened and ground lead screws.
- One-shot automatic lubrication of all bearing surfaces.
- Three-speed spindle.

No. 20 Hydraulic Surface Grinder, 6" x 18" x 12" also available. Write for Catalog T-37-20

Another Covel FIRST . . .
HARD CHROME TABLEWAYS



This money-saving accuracy-preserving feature was originated by Covel and first introduced by Covel at the 1947 Machine Tool Show. Hard Chrome Tableways reduce maintenance costs by maintaining the built-in accuracy of hand-scraped ways for extra years of precision service, eliminating periodic re-scraping. This feature is available on all Covel Surface Grinders.

COVEL | PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

Covel offers the Widest Choice in Surface Grinders up to 14" x 24" • Cutter and Tool Grinders • Drill Grinders • Optical Comparators

CIRCLE INFORM-A-GRAM KEY NO. 55

A few examples of work produced on Gorton Pantographs at substantial savings in time and money

240 PIECES PER HOUR
This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

GORTON *Multiple Pantographing*

Volume Production • Precision Tolerances

Tool room accuracy with production line speed is characteristic of Gorton Pantographs. These versatile machines will turn out a dozen . . . or a million . . . finished pieces from one setting with no perceptible variation in required tolerances. From two to six different operations can be performed at each setting with all operations completely automatic within the cutting cycle. In fact, output is limited only by the capacity of the cutter. Spindles turn at 900 to 45,000 RPM providing infinitely variable cutting speeds and feeds.

Shape of part matters little. Two or three-dimensional cutting can be performed on flat, cylindrical, spherical, square or irregularly shaped work. 16 Pantograph models cover a wide range of applications in profiling, grooving, slotting, milling, chamfering, graduating, counter boring, die sinking, mold making, routing, engraving, grinding, burnishing and etching. Models provide manual, semi-automatic and fully automatic cycling. Custom built.

Write for Bulletins 1655, 2595-DS, 2604-DS, 1203.

New P1-2 heavy-duty model with ⅜" spindle capacity and ½ HP motor available

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1203 RACINE ST., RACINE, WISCONSIN

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8846-1P

CIRCLE INFORM-A-GRAM KEY NO. 56

People Are Important

by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

"REPAIRING THE ROOF"

THERE IS AN OLD SAYING to the effect that you can't fix a leaky roof while it's raining and never think about it when it's not. So the roof never gets repaired. The same thing in a way seems to be true about foreman selection. There isn't time to give the matter a thorough thought and consideration when a foreman's job is or is about to become vacant, and when the foreman's slots are all filled, we're not inclined to think too much about it.

The usual course for a company to take when it needs to appoint a foreman in a hurry is to pick either a most experienced hourly worker, or the most productive. Either of these choices can sometimes be an unhappy one. Fifteen years on the job does not necessarily mean 15 years of experience. Quite often it is one year of experience repeated 15 times. In addition, the qualities that make for high productivity are not necessarily the same ones that enable a man to induce others to produce.

The time to think about foreman selection is when you are not pressed to fill a vacancy. The best place to begin is by thinking systematically about the *kinds* of things that the foreman has to do to get his job done and the skills, abilities, and characteristics that he needs to have to do them well. If formal job descriptions exist, they will be helpful as a start but you will probably need to go beyond them to get to the roots of the foreman's job. You will need to ask yourself and get the answer to such questions as these:

1. What decisions will he have to make? How much latitude does he have in such matters as scheduling production, requisitioning raw material, hiring, laying off or firing men, etc.? Your answer to these questions will determine the level of intelligence and judgment required by the job.
2. How complicated is the machinery in his department? Is he responsible for doing or supervising the setting up or are there special set-up crews? Is he supposed to take care of routine maintenance and minor repairs or are these referred to the maintenance department? His need for mechanical ability, and specific experience and know-how will depend upon the answer to these questions.
3. How much and what kind of paper work is involved in his job? Is he expected to collect detailed information and prepare complicated reports of production, inventory, waste and spoilage, etc.? Is he supposed to make written reports? How involved and how frequent are they? And to whom do they go? When you have the answer to these questions you should have a pretty good idea of the educational level needed, and the arithmetic and verbal skills a foreman needs.
4. What is the nature of the assignments that he will make to his subordinates? Are they simple, repetitive, and routine so that a minimum of detailed instructions

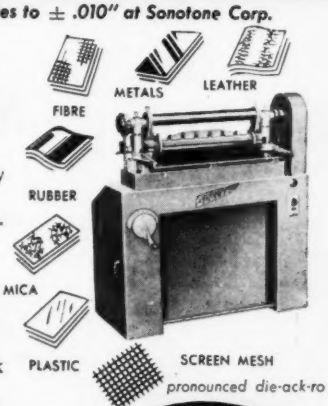
. . . *Continued on Page 61*

Production shearing of nickel sintered plates to ± .010" at Sonotone Corp.

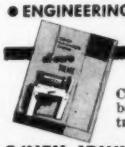
DI-ACRO POWER SHEAR

COAST TO COAST FAVORITE FOR—

- **PRECISION**—strips less than .025" wide accurately sheared, parts exactly duplicated.
- **CUTTING SPEED**—from 30 to 200 strokes per min. Continuous and single stroke operation.
- **CAPACITY**—16 gauge sheet steel.
- **SIMPLICITY**—no experience needed to operate.
- **RUGGED CONSTRUCTION**—backed by warranty.
- **SELECTION**—four models, immediate delivery.
- **ECONOMY**—price and operating costs are rock bottom.
- **ENGINEERING SERVICE**—always at your disposal.



pronounced die-ack-ro

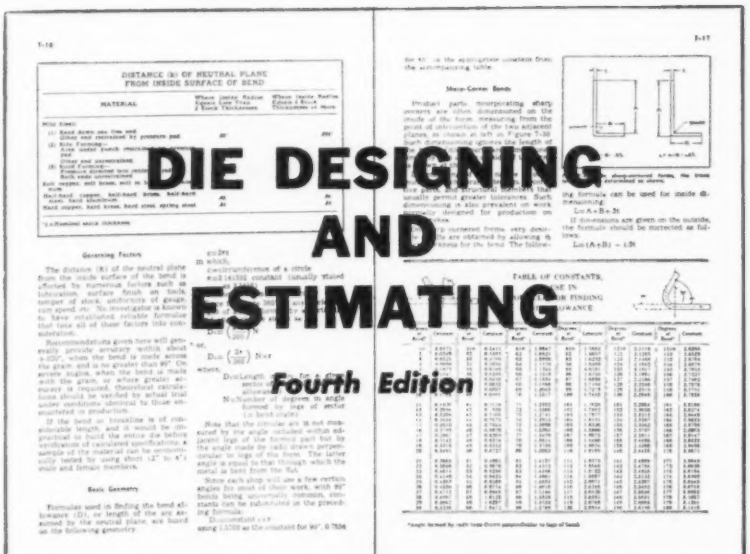


SEND FOR SHEAR MANUAL
Consult the yellow pages of your phone book for the name of The Di-Acro distributor near you or write:

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO., 315 8th Ave., Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 57



DIE DESIGNING AND ESTIMATING

Fourth Edition

Written expressly for–

- Die Designers
- Die Engineers
- Tool & Die Makers
- Owners & Managers of Tool & Die Shops & Depts.
- Students
- Apprentices and . . .

368 pages, 26 chapters, over 400 illustrations, charts and graphs. Completely indexed.

USE THIS COUPON!

- **Valuable, too, as a reference and refresher for the die experts who are more than qualified to write a comparable text.**

A few of the major subjects covered:

Economical Use of Strip Stock
Step-by-Step Design of the Basic Dies
Short-Run, Lamination and Progressive Dies
Detailed Descriptions of Many Successful Dies
Effective Use of Inclinable Presses
Factors Affecting Perforator Life and Failure
Deep-Drawing Techniques
Blank Development
Time-Unit Values for Estimating Die Costs
Determining Required Press Capacity

Price, $7.50* per copy. Immediate Shipment.

Huebner Publications, Inc.
1975 Lee Road, Cleveland 18, Ohio
Gentlemen:

Please ship immediately _____ copy (copies) of DIE DESIGNING AND ESTIMATING, Fourth Edition, at $7.50* per copy.

COMPANY_____

By_____ TITLE_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Open account shipments on purchase orders of rated companies. Otherwise, check must accompany order. No C.O.D.'s please.

*Ohio customers add 3% sales tax.

Use SIZE CONTROL *REVERSIBLE* PLUG GAGES

FOR FAST, ACCURATE GAGING AT LOWEST COST...

...our catalog 53 tells you how!

SIZE CONTROL COMPANY

2500 West Washington Boulevard • Chicago 12, Illinois • MOnroe 6-4710

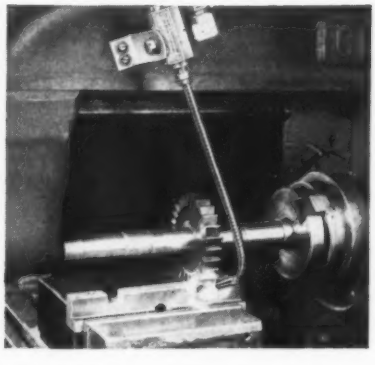
Division of AMERICAN GAGE and MACHINE COMPANY

SIMPSON ELECTRIC COMPANY | SIZE CONTROL COMPANY | WALSH PRESS & DIE COMPANY | STANDARD TRANSFORMER COMPANY

MIST COOLING MEANS LONGER TOOL LIFE

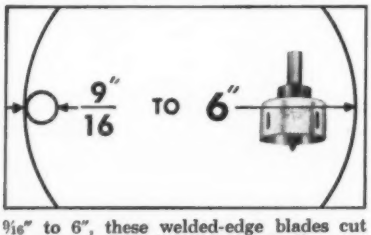
Recent reports by metal cutting specialists indicate that mist cooling produces important benefits in longer tool life, improved work quality and reduced heat distortion of work on a wide variety of operations. Mist cooling systems like the MILFORD Atom-Lube combine compressed air and cutting fluid, producing a fine mist to remove heat from the tool's cutting edge and from the work. This is the major factor in improved tool performance.

The MILFORD Atom-Lube system is a ruggedly designed unit made specially for tough industrial applications. Adaptable to almost any piece of equipment, its range of applications is only limited by the industrial user's imagination. For more complete information about making these savings available for your operations, write to MILFORD . . . a pioneer in mist cooling.

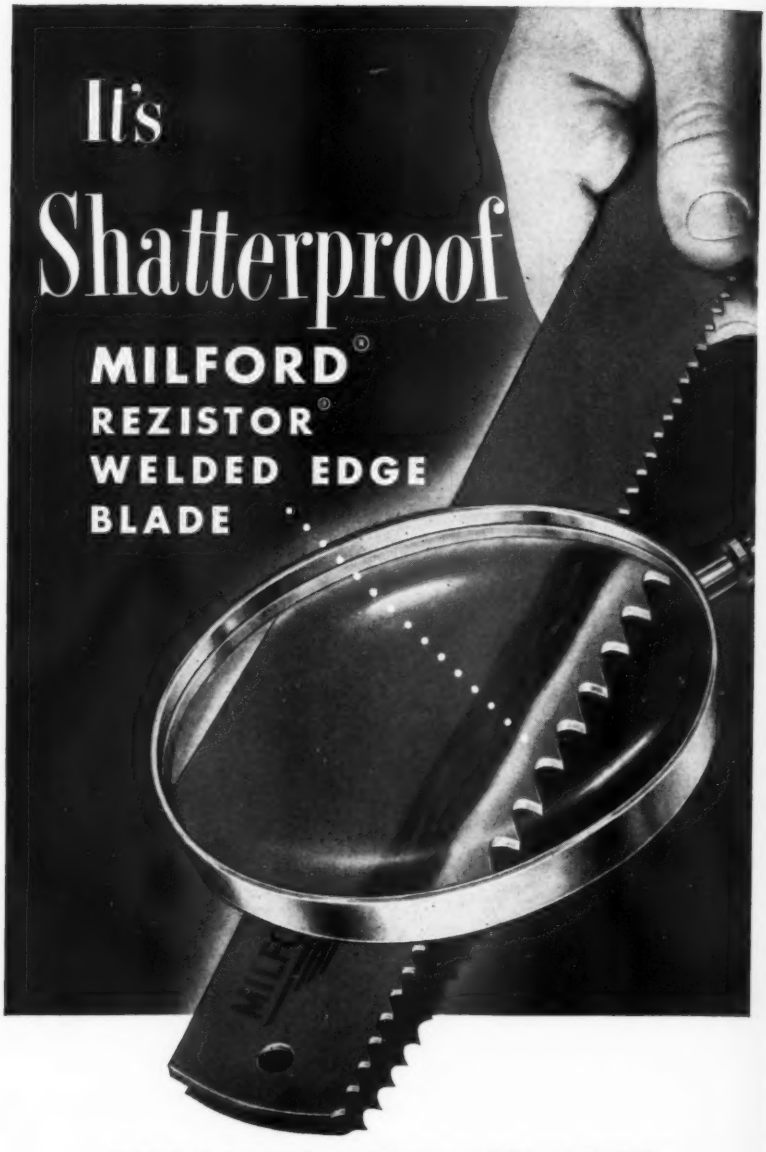


MILFORD Distributors now offering Hole Saw Line

Industrial distributors who carry MILFORD Hack and Band Saw Blades are now stocking the new MILFORD Shatterproof High Speed Steel Hole Saws. Available in a complete diameter range from



9/16" to 6", these welded-edge blades cut clean, round holes in practically any machinable metal or non-metallic. Many manufacturers have investigated their present hole cutting methods, particularly in large diameters, and after comparative tests have selected MILFORD Hole Saws. A new convenience for industrial maintenance work are MILFORD's sturdy metal Hole Saw Kits for popular pipe tap sizes and pipe entrance sizes. Local MILFORD distributors are ready to demonstrate these plumbers' and electricians' Hole Saw Kits, as well as other MILFORD metal cutting saws, to industrial customers throughout the country.



Industry's first choice in *Shatterproof Power Hack Saw Blades,* the REZISTOR WELDED EDGE combines the maximum in safety and metal cutting performance. Three-ply construction provides a cutting edge of high speed steel with teeth as hard, sharp and long-wearing as any all-hard blade . . . and this edge is *WELDED* and *HOT ROLLED* into a back of tough resilient alloy for superior strength and shatterproof qualities.

MILFORD

BUY FROM YOUR MILFORD DISTRIBUTOR . . . a local businessman who stocks the tools and equipment you need. You'll SAVE TIME, CUT BUYING COSTS and REDUCE INVENTORIES.

THE HENRY G. THOMPSON & SON COMPANY • NEW HAVEN 5, CONNECTICUT

Saw Blade Specialists for Over 80 Years

HACK SAW AND BAND SAW BLADES • HOLE SAWS • GROUND FLAT STOCK

CIRCLE INFORM-A-GRAM KEY NO. 60

... Repairing from Page 57

are necessary or are they generally involved, and each different from the other so that in almost every instance, he will need to give the subordinate a complete understanding of a new idea? The answer to these questions will tell you the extent to which he needs to be able to make himself clearly understood and to make sure that he has been.

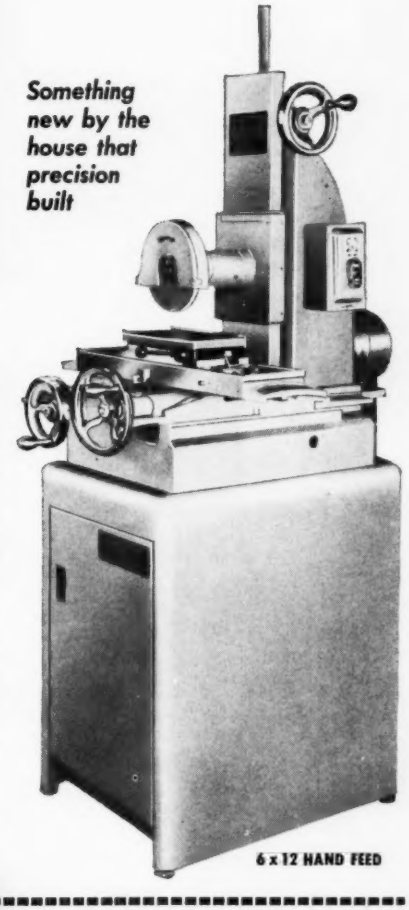
5. How frequently do new men come into his department? How much training and at what level do they need when they arrive? Does he, in other words, need to be a good teacher and a frequent one? Does he need to teach highly complicated jobs to people with little or no previous experience in them or are the people he receives fully trained and competent to perform their jobs before they reach his department?
6. What are his labor relations responsibilities? Will he work under an elaborate and restrictive union contract with the shop steward continuously breathing down his neck with real or cooked up complaints, gripes and grievances, or will he work in an unorganized situation with the freedom to stimulate and lead his subordinates to improved morale and higher productivity? Will he be impowered and expected to handle labor relations and matters himself or will he be expected to refer them all to the labor relations department?
7. What is the nature and frequency of his contacts outside of the department? Does he have to deal with the maintenance foreman, inspection foreman, shipping department, tool room foreman, with production planning, with quality control? What is the nature of the relationship that he is expected to have with each of these individuals? Are they essentially the same across the board, or should they vary depending upon the department with which he is dealing. The success of many foremen's jobs depends as much upon their dealings with their peers and superiors as upon their dealings with their subordinates. Generally speaking, the broader and more varied the outside contacts, the greater will be the need for social skills, tact, diplomacy, and the ability to achieve his department's objectives without being overly demanding and creating antagonisms.
8. What part is the foreman expected to play in management? Will he participate in decision making, and if so, to what extent, or will his role be that of implementing decisions made at higher levels of management.

Before you can repair a hole in the roof, you need to find it. Before you can do a really good job of foreman selection, you need to know what you expect of your foreman. Then you can begin to decide what training, experience, knowledge, skills and personal characteristics. Getting higher levels of management to sit down and take a systematic look at what you would expect of your foremen, is an important first step. Perhaps when you have done this you may even want to pause and consider making some changes in the structure of your foreman's jobs. Answers to questions like those above will help to clarify your own thinking about a foreman's place in your management structure. When you have done this you will be in a much better position to think about how to select the men who will fill foreman vacancies when they occur.

When, where, and how to start the process of looking for future foremen will be the topic of our column next month.

TML BY Harig

Something new by the house that precision built



6 x 12 HAND FEED

6" x 12" precision surface grinder

The new TML by Harig provides extremely fast and accurate grinding, with a new operational ease never before known. 100% more longitudinal travel than before with each rotation of the wheel. You get smooth surfaces in minimum time. Economical—low maintenance.

SPECIFICATIONS

Longitudinal travel.....12⅜"
Transverse travel.....7"
Vertical travel.....12¾"
Working surface of platen.....12" x 6"
½" T slot
Grinding wheel.....7" dia. x ½" face
Grinds 12¾" over platen with 7" wheel
Standard spindle speed 3000 R.P.M.
½ or ¾ H.P. motor—Net wt. with motor 575 lbs.
Can be used with or without floor stand.

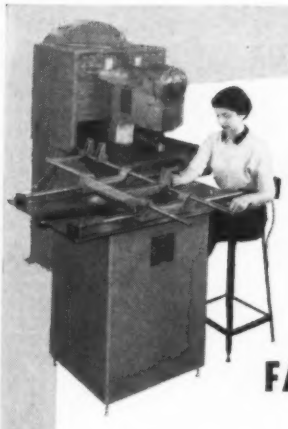
Harig Manufacturing Corp

5761 W. HOWARD ST. • CHICAGO 31, ILL.
Phone NEwcastle 1-5050

SEND ME LATEST BULLETIN ON THE NEW TML GRINDER BY HARIG

Name_____ Title_____
Company_____
Address_____
City and State_____

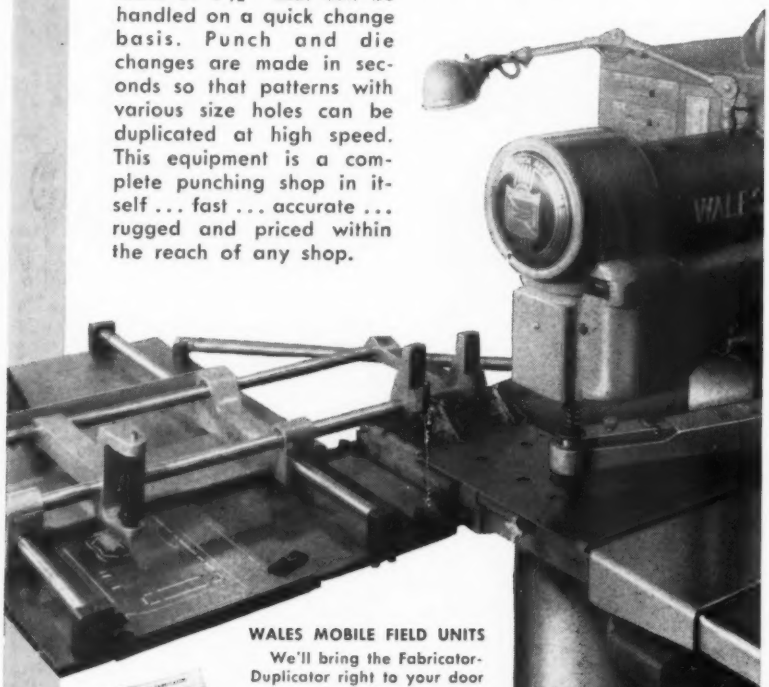
CIRCLE INFORM-A-GRAM KEY NO. 61



DUPLICATE HOLES
Automatically!
WITH THE WALES
FABRICATOR-DUPLICATOR

PUNCH ACCURATE HOLES FROM ANY MASTER TEMPLATE!

Holes in the template, mounted on the Duplicator, are automatically precision punched in the work piece . . . which is mounted on the Fabricator. Any size or shape hole within the limits of 3½" dia. can be handled on a quick change basis. Punch and die changes are made in seconds so that patterns with various size holes can be duplicated at high speed. This equipment is a complete punching shop in itself . . . fast . . . accurate . . . rugged and priced within the reach of any shop.



WALES MOBILE FIELD UNITS
We'll bring the Fabricator-Duplicator right to your door for a demonstration. Ask for details.

SEND FOR BULLETIN NO. 27B
Time studies, specifications illustrations etc., are all yours for the asking.

WALES-Strippit COMPANY
"...the Wales-Way is the PLUS-PROFIT way"
AKRON, NEW YORK
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

See us at IRE Show — New York — Booth 4010 — March 18-21
CIRCLE INFORM-A-GRAM KEY NO. 62

Coming Events

Mar. 5-7. American Machine Tool Distributors' Association. Spring Meeting. El Mirador Hotel, Palm Springs, Calif.

Mar. 5-8. Third Annual High-Speed Computer Conference. Louisiana State University, Baton Rouge, La.

Mar. 6-8. Pressed Metal Institute. Annual Spring Technical Meeting. Hotel Carter, Cleveland.

Mar. 7. Machine Design Division, Cleveland Engineering Society. 14th Annual Machine Design Conference. Cleveland Engineering Society, Cleveland.

Mar. 11-14. National Electrical Manufacturers Association Meeting. Edgewater Beach Hotel, Chicago.

Mar. 13-15. National Fluid Power Association. Annual Meeting. Hollywood Beach Hotel, Hollywood-by-the-Sea, Fla.

Mar. 18-21. Society of the Plastics Industry, Inc. National Plastics Conference and Pacific Coast Plastics Exposition. Biltmore Hotel and Shrine Exposition Hall, Los Angeles.

Mar. 18-21. First Military Automation Exposition. Trade Show Building, New York City.

Mar. 18-21. Institute of Radio Engineers Show. Coliseum, New York City.

Mar. 18-21. American Society of Mechanical Engineers. Second National Conference of the Gas Turbine Power Division. Sheraton Cadillac Hotel, Detroit.

Mar. 19-21. New England Chapter, American Material Handling Society. First Expo-Clinic. Commonwealth Armory, Boston.

Mar. 23-28. American Society of Tool Engineers. Silver Anniversary Technical Meeting and Convention. Shamrock Hilton Hotel, Houston.

Mar. 25-29. Society for Nondestructive Testing. Western States Convention and Technical Sessions. Ambassador Hotel, Los Angeles.

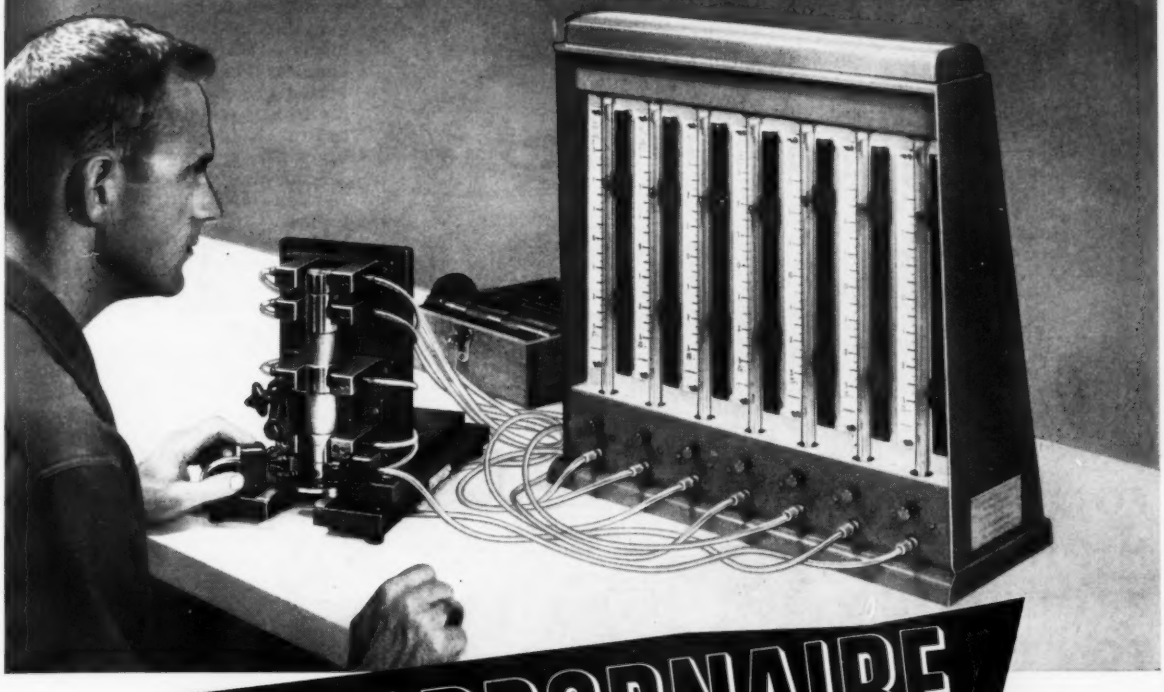
Mar. 25-29. American Society for Metals. Tenth Western Metal Congress. Los Angeles.

Mar. 27-29. 19th Annual American Power Conference, sponsored by Illinois Institute of Technology, 14 universities, and nine technical societies. Chicago.

Mar. 28-29. American Institute of Industrial Engineers, Cleveland Chapter. Sixth Annual Spring Conference. Hotel Cleveland, Cleveland.

Apr. 1-2. Fifth Midwestern Conference on Fluid Mechanics and Third Midwestern Conference on Solid Mechanics, concurrently. University of Michigan, Ann Arbor.

Speed Inspection
OF PRODUCTION PARTS!



NEW **DEARBORNAIRE**

MULTIPLE COLUMN AIR GAGING INSTRUMENTS

Special Air Gaging Fixtures designed and built to meet your particular application requirements. Complete engineering service available upon request.

Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.

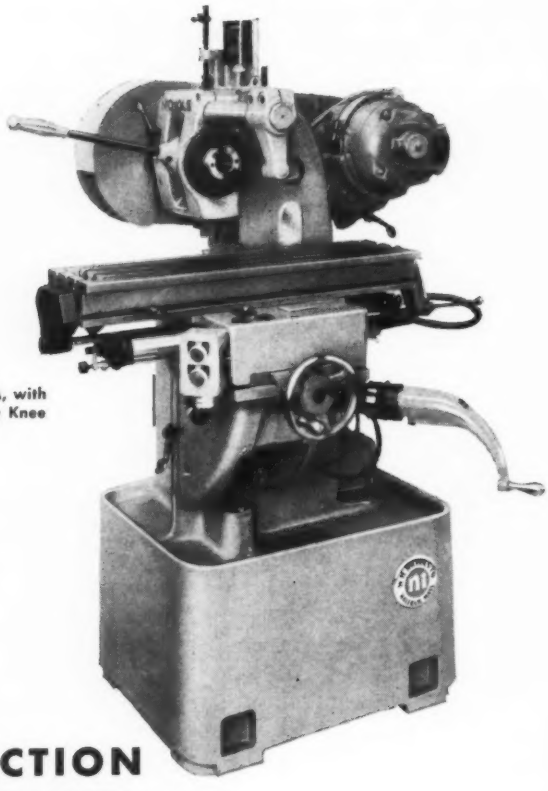
To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced . . .

- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
- New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
- Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
- Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.

Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!

AIR GAGE DIVISION
DEARBORN GAGE COMPANY
22038 Beech Street • Dearborn, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 63



Model 8-SA, with Heavy-Duty Knee

FOR HIGH PRODUCTION TO "TENTHS"

SEMI-AUTOMATIC NICHOLS MILLER

"The Versatile Miller That Uses Its Head"

Nichols Semi-Automatic Millers are equipped with "easy to set up" air-hydraulic table cycles providing rapid approach, variable cutting feed, and rapid return. The operator merely loads and unloads.

In addition to the automatic table feed, the Rise and Fall Spindle head and the Cross Feed may be so equipped. It adds up to a flexible combination of synchronized automatic motions which make Nichols ideal basic millers for modern production lines.

Available in two models—the 8-SA with Heavy Duty Knee and Saddle to support 8½" x 30" table having 14" stroke . . . and the 6-SA with Standard Duty Knee supporting 6¾" x 21" table having 9" stroke.

The Nichols SEMI-AUTOMATIC, and all Nichols Millers, provide unequaled accuracy that *saves cutter costs* and BOOSTS PRODUCTION.

CONDENSED SPECIFICATIONS

	MODELS	
	6-SA	8-SA
Table Working Surface	6¾" x 21"	8½" x 30"
Total Table Stroke	9"	14"
Total Cutting Stroke	5¾"	14"
Transverse Travel	7"	6"
Vertical Travel—Knee	13½"	11"
Rise and Fall of Spindle	4½"	4½"

Selective Speed Ranges up to 5000 R.P.M.

MANUFACTURED BY W. H. NICHOLS COMPANY

National Distributors **THE ROBERT E. MORRIS COMPANY**

5007 FARMINGTON AVENUE • WEST HARTFORD 7, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 64

HYDRAULIC TRACER EXTENDS WORK RANGE OF LATHE

A hydraulic tracer attachment, has been designed that adapts the Hendey No. 2E general purpose lathe for production turning jobs. It enables manufacturers to add a production machine at relatively low cost and enables the machine to be reconverted to general lathe service simply by removing the hydraulic tracer control and template mounting brackets.

Since the tracer unit, built by the Hendey Machine Division, Barber-Colman Company, comes as a complete package with the pump and sump mounted on the floor at the rear of the machine there are no additional external plumbing connections required.

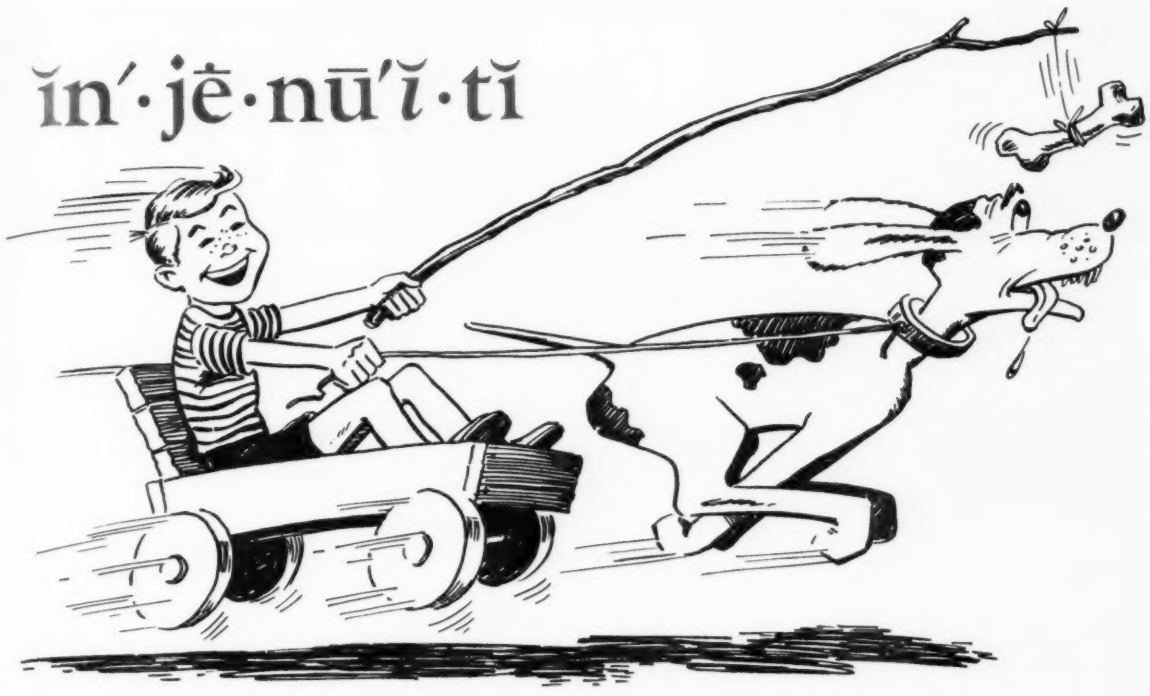
Mounting of the tracer is extremely simple and requires no drilling or tapping of any holes for either the tracer attachment or the template bracket. The tracer attachment replaces the standard compound and is held in place by the two compound bolts. Two additional bolts hold down the template holding bracket, one at each end.

A flat template is used for all production turning operations with the template being mounted at the front of the machine. For a relatively modest production run, the cost of template making is in line with the results obtained. Even when the production run consists of as few as three pieces, it pays to set up the tracer attachment. When runs are longer, the advantages of tracer turning are obviously multiplied.

The combination of tracer turning and the Hendey stepless speed control that is a feature of the No. 2E lathe, assures the machining job will be done at the right speed and feed to give an outstanding surface finish. Getting the close tolerances and fine

finishes that are readily obtainable on the tracer-equipped Hendey No. 2E, means that the user can reduce or even eliminate second operation finish turning.

The ability to change speeds when the spindle is under load enables the machine to turn at virtually constant surface speed since the operator has an infinitely variable electronic drive from 15 to 1500 rpm right at his fingertips. Equally important from the production standpoint is the instantaneous dynamic brake that assures faster stopping and reversing of the spindle.



the real way to spell AUTOMATION

Boiled down to its fundamentals automation only means imparting automatic operation to repetitive production processes. It can cover a single machine as well as an entire production line.

Most of the needs of automation can be met by relatively simple controls plus a healthy helping of old fashioned ingenuity.

For example, we manufacture a series of electrically controlled air-powered work units. With one or more of these devices you can convert a wide range of standard machines and machine tools to fast automatic units. Or you can use them to form the basis of inexpensive, tool-room-built special purpose machines.

It doesn't matter what you make — how big or small your operation — you'll find Bellows "Controlled-Air-Power" Devices will play for themselves quickly — often before the due date of the invoice we'll send you.

This booklet interesting. Write for it.

Bulletin ML-3 — the quick story of what Bellows can do for you.

Address: The Bellows Co., Akron 9, Ohio, Dept. TP-357.

In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ont.

The Bellows Co.

AKRON 9, OHIO

Manufacturers of Air Powered Work Units: Air Motors, Air Cylinders, Air Hydraulic Controls, Work and Tool Feeding and Holding Devices. Field Engineer Offices in all principal cities and industrial areas in the United States and Canada.

759-B

CIRCLE INFORM-A-GRAM KEY NO. 65

SHOP

This Informative Booklet from Behr-Manning Co., Troy, N. Y., details the coated abrasive belt and its use in machine tools. Covered are line and station belt polishing, and platen grinding with abrasive belts. Sections are devoted to moving platen belt, conveyor feed, swing frame, centerless, and drum grinders; multi-belt machines; shear-bar-strip polishers; and free belt machines. The final section explains how to convert a lathe from a polishing lathe to a backstand belt unit. Obtain copies of the illustrated booklet from the company, or — **Circle Inform-A-Gram No. C1.**

"Die Casting with Zinc Base Alloys," a technical booklet on the best zinc die casting methods, has been released by Henning Bros. & Smith, Inc., 91-127 Scott Ave., Brooklyn 37. Presented are specific operating details on the requirements of alloys which affect the properties of the casting produced. Also discussed are the factors which influence the production of sound zinc alloy castings. Die casting operators are given the basics of gating and the advantages of a heavy gate are detailed. In addition, the booklet covers the effects of all factors bearing on surface appearance.
Circle Inform-A-Gram No. C2.

A Revised Edition of Unified and American External Screw Threads contains general information for both straight, external and internal threads. It replaces the Third Edition of the ASA B1.1 — 1949. The tables are limited to external threads only. The booklet contains detailed descriptions on screw thread designation and thread applications, as well as terms and definitions relating to threads. A new table has been added showing a summary of all of the standard thread series, and basic thread data is included for the 27 TPI Thread. Obtain copies of the booklet, priced at $.75 each, from Reed Rolled Thread Die Co., Dept. TP, Worcester 1, Mass.

Plated Wire Characteristics are described in eight-page Bulletin K-10 issued by National-Standard Co., Niles, Mich. Nickelply and Brassply electro-plated steel wires are used for a variety of wire goods where product appearance or corrosion resistance are essential. The booklet details the types of steel available as base material, tensile strength, and corrosion resistance characteristics of various coating thicknesses.
Circle Inform-A-Gram No. C3.

Alignment Testing is the subject of an illustrated pamphlet published by Engis Equipment Co., 431 S. Dearborn St., Chicago 5. Discussed are measuring instruments, optical methods, and practical applications. Also detailed are the auto-collimator and the block level. The company will provide copies of the pamphlet, or — **Circle Inform-A-Gram No. C4.**

Selection and Use of Hand and Power Hack Saw Blades is covered in the "Handbook of Metal Sawing" from W. O. Barnes Co., Inc., 1297 Terminal Ave., Detroit 14. Selection of the correct blade for any job is

simplified by charts. Recommended cutting speeds, feeds and techniques are also tabulated. Common metal-cutting problems and their preferred solutions are featured in the handbook.
Circle Inform-A-Gram No. C5.

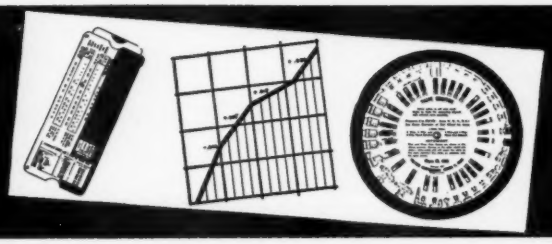
An Aluminum Conversion Chart to convert old aluminum type designations to new ones has been released by All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y. Included on the same sheet are six other charts to aid in the selection of alloys and fluxes.
Circle Inform-A-Gram No. C6.

"Designing Your Product" contains condensed performance data, design relationships, installation procedure and standard size data on Heli-Coil screw thread inserts and the Screw-Lock insert. The booklet is illustrated with application drawings and installation photos. Outlined are hand and power operation techniques that can be used for installing the inserts. A brief description of special inserts for pipe threads, spark plugs and push type inserts is also included. Copies of Bulletin 748 are made available by Heli-Coil Corp., Danbury, Conn., or— **Circle Inform-A-Gram No. C7.**

Copper Clad Technical Data for better printed circuitry is given in Brochure 688 which can be obtained from Formica Corp., 4410 Spring Grove Ave., Cincinnati 32, O. Discussed are the advantages of printed circuitry and how to make a printed circuit. Also detailed are plated circuits, flush circuits, circuit fabricating, and postforming copper clad laminates. A comprehensive table presents property data and another gives comparative information. One section is devoted to describing the grades of base laminates for copper clad sheets that are available.
Circle Inform-A-Gram No. C8.

The Shell Molding Process for Casting Metals is covered in "Plaskon Resins for Shell Molding." Included are design and production considerations, available types of molding machinery, and factors in making a selection. In addition, the booklet touches on gating techniques and precautions, pattern design, resin bonding of shell molds, and special metals handling. For copies of the booklet, contact Allied Chemical & Dye Corp., Barrett Div'n, 40 Rector St., New York 6, or —
Circle Inform-A-Gram No. C9.

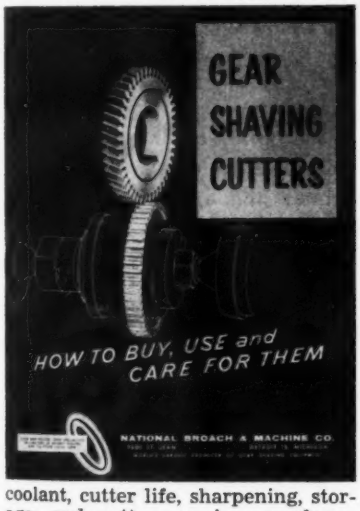
AIDS



A Steel Data Book gives information on machining and fabricating, specifications and tolerances, weights and dimensions, elements and safe loads. Tables, definitions and general data are also included. It is a companion book to the Ryerson Steel Stock List. Direct requests for the steel data book to Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, or —
Circle Inform-A-Gram No. C10.

A Gage Selector has been prepared by Threadwell Tap & Die Co., Greenfield, Mass., as a mate to the Tap Selector. The Gage Selector can be used for both ring and plug gages in fractional or numbered sizes. The selector also gives a short definition of the classes, and specifications on how to order gages. Requests for the Gage Selector can be sent to the company, or —
Circle Inform-A-Gram No. C11.

A Reference Manual dealing with the care and use of gear shaving cutters is now available from National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13. Included in the illustrated manual are cutter specification tables; mounting instructions; and data on speeds, feeds,



coolant, cutter life, sharpening, storage, and cutter repair procedures. Ordering information is included as well as application data and a table of recommended tooth thickness stock allowances for the gear shaving process. Get your copy of Manual CR.56-10 from the company, or—
Circle Inform-A-Gram No. C12.

Brushes and Brushing Machines are highlighted in an illustrated 100-page catalog. Presented is detailed information on how to select and use power brushes, Brushamatic ma-

chines, power brush terminology, etc. Specifications and typical uses are included. For copies of the catalog, "Brushes for Industry," contact The Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, or —
Circle Inform-A-Gram No. C13.

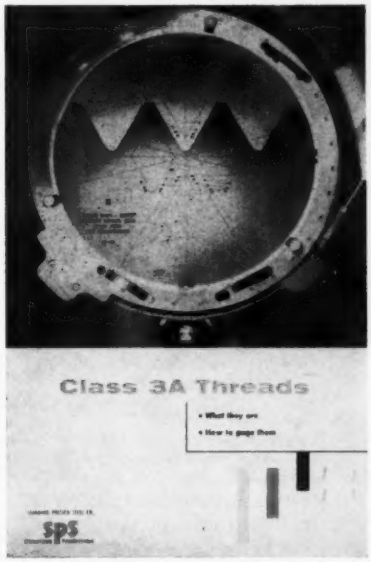
A Ready Reference Data Sheet on WCC, a hot work die steel, is now available from Vanadium-Alloys Steel Co., Latrobe, Pa. Given are heat treatment, composition, and applications.
Circle Inform-A-Gram No. C14.

"Weldirectory for Mild Steel and Low-Alloy High-Tensile Steels" has been revised to include the newest iron powder and other electrodes. Each electrode is described and physical properties, applications and welding procedures noted. Obtain Weldirectory SB-1351 from The Lincoln Electric Co., Cleveland 17, or —
Circle Inform-A-Gram No. C15.

A Revised Chart of Cast High Alloy Designations has been announced by Alloy Casting Institute, Mineola, N. Y. Included are standard designations and chemical composition ranges for heat and corrosion resistant cast alloys. Two new cast alloys of the "18-8" variety, with very low carbon contents, have been added. In addition, the free-machining grade CF-16Fa has been reinstated.
Circle Inform-A-Gram No. 16.

"Trends and Developments for Electrical Design Engineers" is the 12-page booklet which has been released by the Metallurgical Products Department of General Electric Co., Detroit 32. Included is information on permanent magnets, Thermistors and Thyrite varistors. The publication, divided into four sections, discusses the subjects in relation to a designer's problems. Pointed out are new approaches, possibilities, and methods for using the products. Among the subjects covered are how magnets help designers miniaturize products and determining the proper magnet for a specific application.
Circle Inform-A-Gram No. C17.

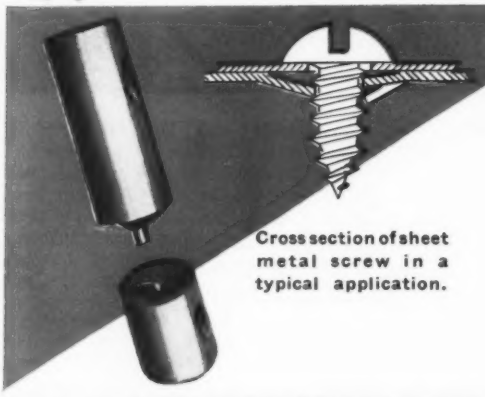
A Booklet on Threads detailing thread fit and gaging is now being distributed by Standard Pressed Steel Co., Box 600, Jenkintown, Pa. It warns that many receiving inspection departments are accepting oversize and undersize screw threads because they are not using the correct types of gaging to check pitch diameter. The booklet points out that



two different types of thread gages, a functional type for checking the high limit of tolerance and a pure pitch diameter type for checking the low limit of tolerance, must be used. Although Class 3A threads are discussed, the principles can be applied to gaging of other classes of external thread fit. Write to the company for copies of "Class 3A Threads," or —
Circle Inform-A-Gram No. C18.

Now! FOR EVERY TYPE OF FASTENER... R-B Punches and Die Buttons

THREAD-HOLE FORMING . . .



Cross section of sheet metal screw in a typical application.

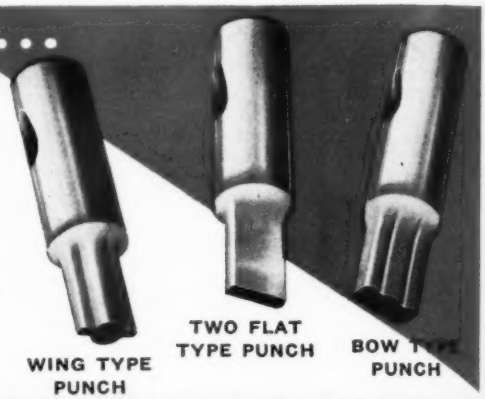
Cuts Assembly Time and Material Costs

With each stroke of the press, R-B Thread-Hole forming punches pierce a hole, lance a radial slit, and form surrounding metal into a spiral cone that conforms to the pitch of your sheet metal screw thread. By producing these formed-thread-holes directly in the sheet metal you eliminate the need for using nuts, washers, tap strips, etc. R-B formed-holes provide greater holding power against vibration, contraction, etc. R-B Thread-Hole Forming Punches and Die Buttons are carried in stock in several sizes.

FOR SIMMONS TYPE FASTENERS . . .

R-B Piercing Assures Low-Cost Holes

R-B manufactures a line of standard punches and die buttons that rapidly pierce exactly the type of holes required for Simmons spring-lock fasteners. Punches and die buttons have the standard R-B ball-lock feature which prevents vertical and radial movement in the retainer—assures accurate alignment without additional keying—permits quick insertion and removal. Carried in stock, these standardized punches and die buttons can be used in any conventional press.



WING TYPE PUNCH

TWO FLAT TYPE PUNCH

BOW TYPE PUNCH

R-B CLINCH NUT TOOLING . . .

Cutaway showing how R-B tooling swages work piece as well as clinch nut. This produces a strong key which eliminates nut rotation.

Punch holds nut magnetically. Nut pierces hole and is clinched underneath by the die button.

Will Tighten Your Fastening Costs

R-B Clinch Nut Tooling permits you to insert and clinch one or more nuts with each stroke of the press—no extra clinching or welding is necessary. Also, the same die can pierce, form or blank your product. R-B furnishes standardized punches, die buttons, hoppers and flexible feed chutes for any size or shape Clinch Nuts.

Special R-B Punches and Die Buttons

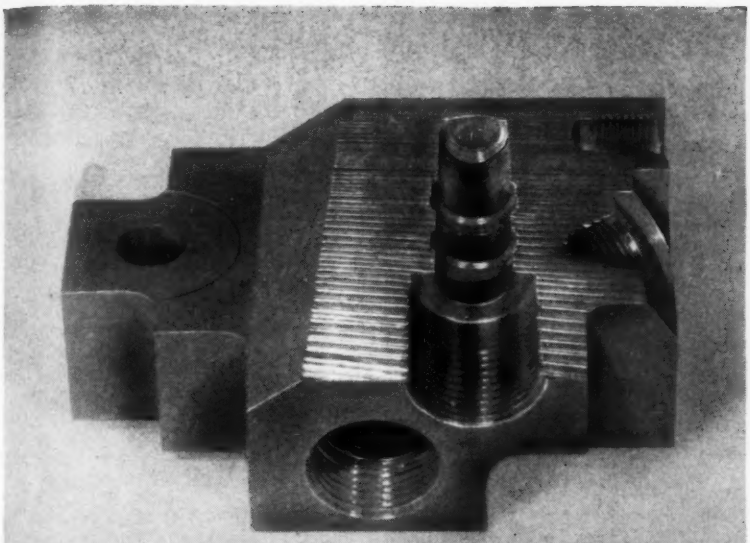
R-B will design and manufacture special punches and die buttons that will economically pierce holes for any type of fastener—Use R-B Engineering Service For Your Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION

ALLIED PRODUCTS CORPORATION

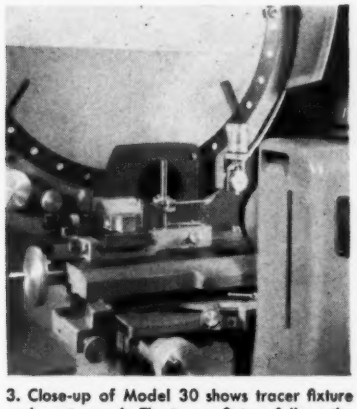
DEPT. 92 . 26476 CAPITOL AVENUE . DETROIT 39, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 68

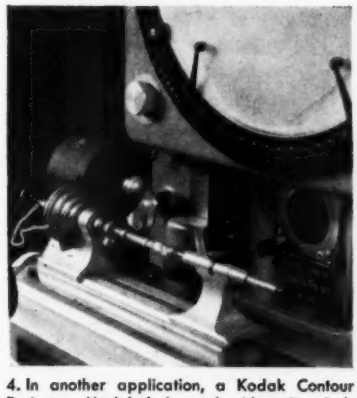


1. Cross section through pressure control valve body shows tricky inspection problem. There are 12 linear and 8 angular dimensions to be measured within the hole shown in cutaway.

2. Part of the receiving inspection department of the aircraft components plant. Model 30 Contour Projector is at the left. Operators work comfortably in normal lighting.



3. Close-up of Model 30 shows tracer fixture and pantagraph. The tracer fixture follows the contours of the hole and translates them into an image on the screen for accurate gaging.



4. In another application, a Kodak Contour Projector, Model 4, is used with a jeweler's lathe, which enables the operator to grind the radii on a servo mechanism piston to a tolerance of .0005" by watching the magnified image during grinding.

2/3 cut in gaging time

helped prove how 23 more Kodak Contour Projectors would return their cost inside 12 months

A leading manufacturer of aircraft components recently purchased 23 Kodak Contour Projectors when cost studies showed the machines *would pay for themselves in 12 months.*

The studies were based on the time and labor saved by Kodak Contour Projectors in inspection of parts like the pressure control valve body pictured above.

This component has 12 linear and 8 angular dimensions to be checked—*all inside a blind hole.* With a Kodak Contour Projector, Model 30, inspection of 25 pieces takes just 3½ hours. Formerly, the same job took 10 hours and was less accurate. Hundreds of manufacturers across the country have had similar experiences with all sorts of complex parts, large and small.

Whether your problem involves receiving, production, or final inspection, there's a Kodak Contour Projector to do the job quickly, accurately, and at low cost. To learn more about how optical gaging can work for you, send for your copy of the free booklet "Projection Gaging with Kodak Contour Projectors," or write for the name of the representative in your area. No obligation, of course.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.
Apparatus and Optical Division

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

CIRCLE INFORM-A-GRAM KEY NO. 69

Makes tough ones *EASY* —and easy ones *SURE!*

THE PROFILOMETER® makes it easy to measure the roughness of nearly *all* machined and finished surfaces, no matter where they are located. It *shows* the roughness, on a meter, in standard *microinch units.* And it gives *consistent, accurate readings* for any surface from polished glass to rough-machined forgings — regardless of the place, the time, the operator, or the equipment used.

As you can see, the Profilometer is a SHOP TOOL, and can be used wherever desired. It is fast and simple to operate (needs no special skill or experience) — is built for hard service — and is reasonably priced. It is *standard equipment* in *thousands* of production and inspection departments, throughout the world.

FREE ILLUSTRATED BULLETIN gives details, and describes *cost-saving applications.* Write for it!

OTHER MICROMETRICAL PRODUCTS include the PROFICORDER® (for obtaining magnified surface profile records); WAVOMETER® (for measuring waviness around surfaces of rotation); ANDEROMETER® (for measuring the over-all quality of assembled ball bearings). Illustrated bulletins on request.

Representatives in principal industrial centers throughout the Free World

Names of above products are registered trade-marks.

MMC MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 70

FILMS TO SEE

A plant demonstration of the opportunities for automating drilling, tapping, insertion, and driving operations of headless set screws in sizes as small as No. 2 x ⅛" long is presented in a 16 mm color movie. It shows how manufacturers are using the Setko system of hopper feeding set screws to cut operation time 80 to 90% and reduce floor losses from 30% to zero. Also noted are new applications. This movie is supplied on a loan plan by Set Screw Mfg. Co., Bartlett, Ill.

More than twenty films are now being offered for free use by Allegheny Ludlum Steel Corp., Pittsburgh 22. These 16 mm color movies with sound cover the production, fabrication, and end-use of the special alloy, stainless, tool, and electrical steels produced by the company.

Trukveyors, in-the-floor type conveying systems for moving four-wheel platform trucks, and how they solve material handling problems, are the subject of a 16 mm color-sound film. "Pathway to Profits" illustrates the basic operation of the Trukveyor system. Direct requests for free showings of the film to Link-Belt Co., Prudential Plaza, Chicago 1.

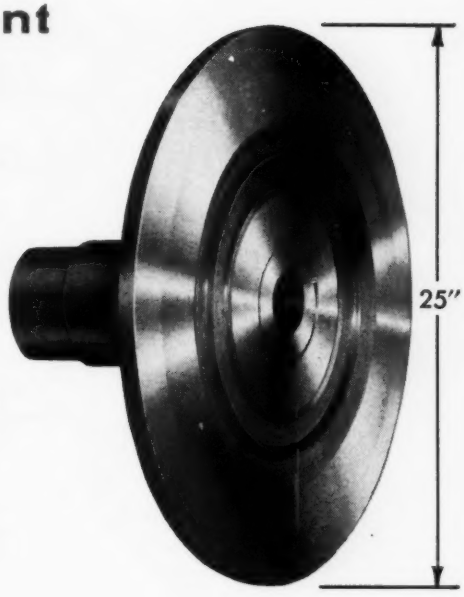
Fire prevention in industry is covered in "The First Five Minutes," the National Board of Fire Underwriters' new film. Emphasized is the importance of the industrial fire brigade in plant fire prevention and protection. Copies of this black and white movie which runs 27 min, can be obtained on loan from the Bureau of Communication Research, Inc., 13 E. 37th St., New York 16.

A sound-strip film on industrial paint masking methods which increase efficiency and reduce production costs has been made for in-plant showing by Minnesota Mining and Mfg. Co., Dept. L6-321, St. Paul, Minn. The movie, "Pete, the Paint Boss, and the Efficiency Expert," points out how the added costs from rejected or reworked parts can be eliminated by the correct application of a masking tape best suited for the particular job.

Maintenance people are shown how to install and properly maintain electric motors in "How to Make a Motor Go—and Go, and Go, and Go," and "How to Take Step Seven." These 35 mm slide films are issued by Allis-Chalmers Mfg. Co., Milwaukee 1.

℞ — *Fast Cure for BIG Complications . . .*

A SPECIAL P&J Treatment with STANDARD Tools

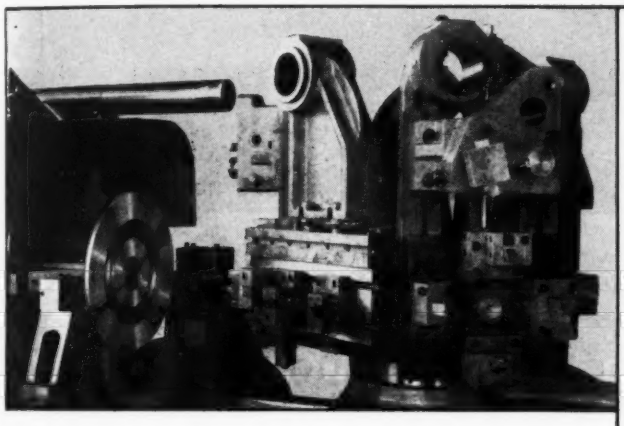


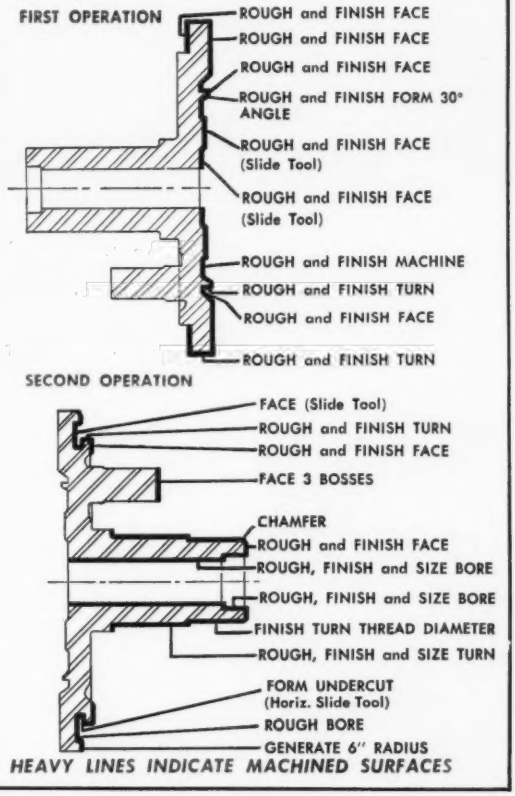
THE PART: A BIG (25-inch diameter) heavy, cast steel Pressure Plate Hub.

THE COMPLICATIONS: 42 separate roughing and finishing cuts involving very heavy stock removal. High accuracy and close concentricity required on *all* machined surfaces, and a fine micro-finish specified for two hub diameters!

THE TREATMENT: Take a big, powerful Potter & Johnston 10-U Automatic; team it with P&J-Engineered Tooling using *STANDARD*, basic tools.

THE RESULTS: Part finished quickly and economically according to specs in just over 47 minutes machining time . . . and tool costs kept to an absolute minimum.




FIRST OPERATION
ROUGH and FINISH FACE
ROUGH and FINISH FACE
ROUGH and FINISH FACE
ROUGH and FINISH FORM 30° ANGLE
ROUGH and FINISH FACE (Slide Tool)
ROUGH and FINISH FACE (Slide Tool)
ROUGH and FINISH MACHINE
ROUGH and FINISH TURN
ROUGH and FINISH FACE
ROUGH and FINISH TURN
SECOND OPERATION
FACE (Slide Tool)
ROUGH and FINISH TURN
ROUGH and FINISH FACE
FACE 3 BOSSES
CHAMFER
ROUGH and FINISH FACE
ROUGH, FINISH and SIZE BORE
ROUGH, FINISH and SIZE BORE
FINISH TURN THREAD DIAMETER
ROUGH, FINISH and SIZE TURN
FORM UNDERCUT (Horiz. Slide Tool)
ROUGH BORE
GENERATE 6" RADIUS
HEAVY LINES INDICATE MACHINED SURFACES

Performance like this is no exception; it's just one more example of the way a Potter & Johnston Automatic Chucking Turret Lathe can take problem parts in stride. If you're looking for new standards of speed and economy, make it a standard practice to put your complicated jobs on a P&J Automatic with P&J Tooling. In addition to the big 10-U used to machine this massive pressure plate hub, P&J produces a complete line of Automatics for every work size requirement, so send for complete information today.

Write today for complete information . . . or phone the Pratt & Whitney Branch Office near you, and ask a Direct-Factory Representative to call and discuss your requirements. **Potter & Johnston Company, Pawtucket, Rhode Island (Subsidiary of Pratt & Whitney Company, Incorporated).**

POTTER & JOHNSTON

Precision Production Tooling for more than Fifty Years

AUTOMATIC TURRET LATHES • NEWARK GEAR CUTTERS

CIRCLE INFORM-A-GRAM KEY NO. 71

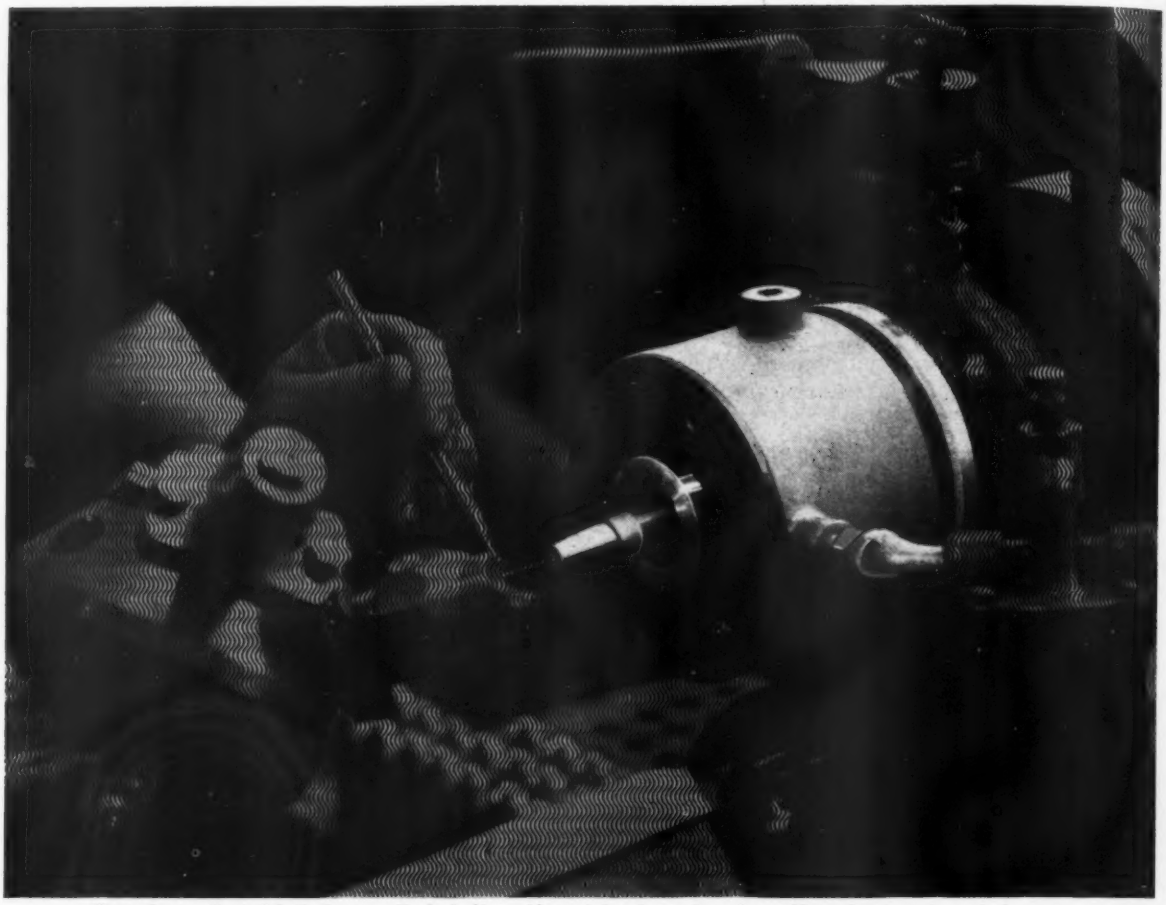


Photo: *Courtesy Harris Calorific Company, Cleveland, oldest and largest independent producer of gas welding and cutting equipment in the country.*

ERICKSON AIR CHUCKS

a hot tip for cutting costs on cutting-torch tips

Erickson '09 Model Air Chuck for heavy work. Quick-acting air chuck, with leverage principle, gives 3 to 4 times holding power of ordinary chucks.

"We have used Erickson Chucks since 1942 . . . and would recommend Ericksons to any plant which wants to increase production . . ." That is the report from Harris Calorific Company, big-name manufacturer of gas cutting and welding equipment.

The company uses four No. 400 Erickson Air Chucks for finishing leaded copper cutting-torch tips. Operations consist of drilling, reaming and polishing—at the rate of approximately *100 pieces per hour per chuck*.

Compared to previous methods, Harris Calorific Company claims, trueing-up time has been cut 70% . . . chucking time 60% . . . set-up time 25%.

Let an Erickson representative show you how to cut your production costs—*accurately*—with Erickson Air Chucks.

AA-3709

Bothered by a tough holding problem? Then let us show you how Erickson holding tools speed production, lower costs. Call us or write for Catalog K.

ERICKSON TOOL COMPANY

2301-3 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS	AIR-OPERATED CHUCKS
FLOATING HOLDERS	EXPANDING MANDRELS
TAP CHUCKS	EXPANDING-COLLETS
TAP HOLDERS	SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 72

editorial: I + SQC + MC + R = Perfection

IF YOU WILL relax for a few minutes and review, mentally, manufacturing's postwar years you will come up with a fascinating bit of history-in-the-making. And you, undoubtedly, have played, and are playing, an important part in the making. So often, we are too busy or too close to it to recognize history-in-the-making until it becomes past history.

We are referring to the evolution of that succession of manufacturing techniques represented by the terms in our algebraic title, i.e., Inspection, Statistical Quality Control, Machine Capability, and Reliability.

Prior to our Defense Program phase of World War II, or 1938-39, Inspection was the be-all and end-all in reconciling product (or workpiece) with specifications. The tools of the trade then, as today, ran the whole gamut of metalworking metrology, from surface plate to thread ring gage. When specifications were tough and machining processes loaded with variables, 100% Inspection was the order of the day — and costly.

As early, however, as in the 1920's a few venturesome souls were in a huddle devoted to shortcutting the laboriousness of 100% Inspection. The question posed was, if a few workpieces turned out to be "on the nose" what was the likelihood that they would all be or what predictable percentage would be?

This invoked the laws of chance and probability, i.e., is that so-and-so across the table holding one pair or a full house? Thus the beginning of today's widely accepted practice of Statistical Quality Control.

Still relying, of course, on the gages and instruments of Inspection, if five random samples of five taken from a tote pan containing 500 pieces were found to be OK the probability was that the entire 500 could have been passed on to assembly with less subsequent costs in misfits, do-over, and scrap than would be charged up had the entire 500 been subjected to 100% Inspection.

The mathematical formulas of Statistical Quality Control, while dealing with variables and probabilities, are in themselves well known, proved and constant. So why should these laws when applied to a batch of 500 pieces come up with an answer of, for instance, 92% acceptable, and, the same laws applied to the next 500 pieces from the same material, machine, and tooling, ring up only 78% acceptable? The laws weren't changing, the pieces weren't behaving like a can of angle worms — so, it had to be the process; the machine and its tooling.

Thus, four or five years ago, the determination of Machine Capability became a factor in not only the ability of the machine to produce to specifications with a predictable degree of consistency and constancy, but also in the buying and selling of machine tools. The buyer wants to know the capability of a machine to do the job he buys it for, and the machine tool builder often has to predicate the sale on a capability factor acceptable to the buyer.

Machine Capability is part and parcel of what has come before, i.e., it uses the mathematical tools of Statistical Quality Control and the physical tools and gages of Inspection.

In this chronology we have had to deliberately over-simplify in order, space-wise, to introduce the fourth term in our equation, i.e., R for Reliability. This term (and determination) is now spreading from the Military to Industry and we will hear a lot more of it. You will be using it in the manufacture of your end product, and we will be using it as the subject of helpful editorial projects.

Product Reliability not only results from Inspection, Statistical Quality Control and Machine Capability, but it is cruelly measured by field tests and by the consumer (the most rugged tester of all).

Worth noting is the RETMA's definition of Reliability:

"Reliability is the *probability* of a device *performing* its purpose *adequately* for the *period of time* intended under the *operating conditions* encountered."

This means that the old stand-by, the spring-wound Big Ben, immune to electric current failure, is pretty apt to get us up in the morning.

It also means that the missile "Snark," which was aimed elsewhere, shouldn't have landed, presumably, in the jungles of Brazil.

Of course, our equation I + SQC + MC + R = Perfection presumes that Perfection can be attained. That is highly presumptuous.

E. Willard Pennington

editor

P.S. If you don't think that time flies . . . next May will see our 10th Annual Issue Featuring QUALITY CONTROL!

THE PROPER USE OF TOOL STEEL

. . . to Make High Production Tools

by William E. Hoffman
Associate Editor

OFTEN PRODUCTION CONTROL MEN schedule their work for tools or dies that are nearly identical but from different suppliers, only to find that even though the tools were designed to perform like tasks and are used in the same way, the difference in service life is surprising.

It is not unusual, when production time is short, for the PA to issue purchase orders for the same tools to two or more "design and build" suppliers. Even when the orders are accompanied by a general scheme of the tool, the tools can be different enough to account for a great difference in performance.

IT TAKES MORE THAN THIS.

It would be impossible to expect two tools designed by two suppliers for identical performance to be physically the same. Their configurations will be different, they will be made of different steels, they will be fabricated on different equipment, and the heat treat methods may be different.

In spite of these differences, they can be expected to perform very nearly the same, from a service standpoint, if the basic principles set down here are followed.

GOOD DESIGN: There was a day when tools were just built. This method of operation is non-existent today; the first thing we consider is design. Design out internal stresses, the principle cause of tool and die failure, or keep them so low that they won't "show".

If the designer can keep in mind that stresses in steels are set up as a result of the differences in the cooling rates of the various areas, he will find his section areas becoming more uniform, which will allow the quenching medium to pick up heat at a more uniform rate. Where feasible, he will use two or more pieces of steel in place of one, if one would be too massive to

permit even cooling. He will drill holes, Figure 1, (if the design allows) to permit better circulation of the quenching fluid during heat treat. He will find that by eliminating sharp re-entrant angles, Figure 1, there will be a better flow of the quenching medium with less eddying and foaming to arrest heat transfer. In die design, where sharp edges may be necessary, the designer will find himself allowing greater distances between these sharp corners and hold-down bolt holes, Figure 2, to avoid a cracking through from stress-point to stress-point.

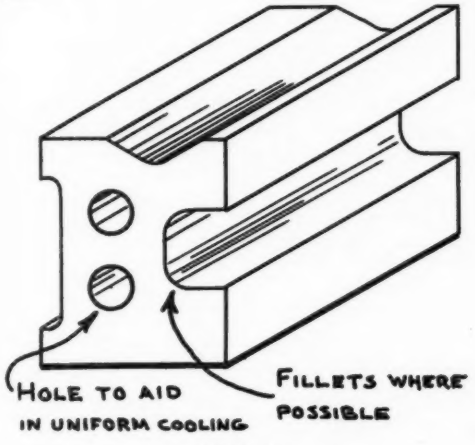


FIGURE 1

PROPER STEEL SELECTION: If each piece of steel used were "hogged" from a larger piece, we could select the steels after designing. But this is not the case and we can be glad of it — what with steel production humping to keep up with demand. The designer must at all times keep in mind the various steel types and their availability as to the sizes which can be fitted into the design. Good design and steel selection are traveling companions; when they are not, the tool will discredit the designer, give the tool maker a headache, and more important, production expectations can only be disappointing.

Each tool steel with its unique microstructure reacts consistently in accordance with how its heat treat specifications are followed; from experience and the cooperation of the steel mill and the heat treating concerns, a designer comes to know what steels to specify.

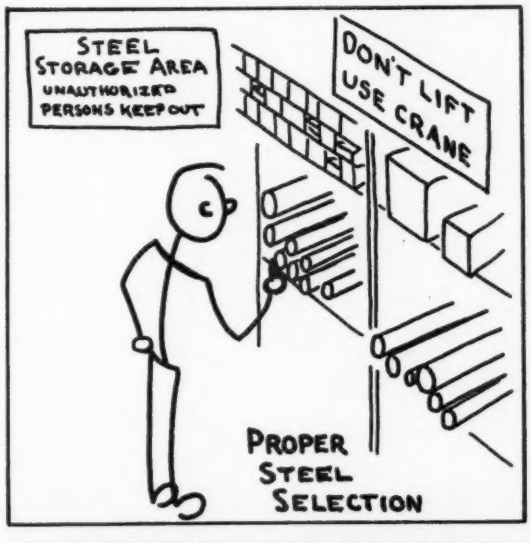
In general, dies which are expected to hold up for exceptionally long production runs and produce burr-free parts will be made from high-carbon high-chromium oil hardening steels; where a tool is expected to work in high temperatures (red hardness a requirement), such as the forging tools used in shell manufacturing, a 5% chrome 1% vanadium hot worked steel is employed; for an odd shaped fixture or one having considerable bulk, air hardening steels offer low internal stress — resulting in stability; knives requiring resistence to dulling and yet needing toughness would best be made from a high-carbon water hardening steel.

PROPER FABRICATION: Probably one of the most flagrant offenders of good tool making is the tool maker who fails to take into account the effect machine marks have on the success of a tool.

Surface cracks or rough machine lines, Figure 3, can hasten failure through fatique from stress concentrations. Class of finish should be specified by the designer, but, the designer's time will have been wasted if the tool maker ignores or misinterprets the indication. It is interesting to note that either the designer or the tool maker could be wrong (poor judgment). However, the work of the designer will usually be backed-up by his checker and supervisor, while the tool maker usually has his work finished before he is checked; and his mistakes are not so easily undone. By the time the tool gets to inspection, pressure will be brought to pass it if at all possible.

For appearance, and to obviate the failure possibility, many toolrooms give all parts a smooth finish all over. If grinding equipment is open, a rough grind (where permissible) will do the speediest and surest job.

All-over grinding pays dividends in several ways. The tool maker has an easier job indicating and fitting the pieces; his pride at turning out a good looking job is important and is carried over to the next job. Having more than



IT TAKES MORE THAN GOOD DESIGN AND THIS.

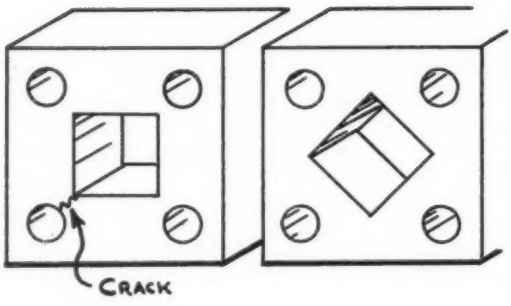


FIGURE 2

one side to square-up on, inspection will be able to check-out the tool with a minimal effort. The customer's confidence in a good looking piece of equipment, especially if it lives up to his expectations, may cause him to purchase from the same source on the next occasion.

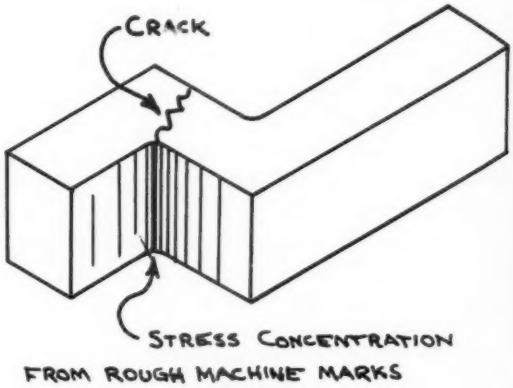
The same stresses and weak points that can be set up by machine marks can be had from identification stamp marks. Such markings should be kept light; or, on extremely critical tools, electrical marking systems should be considered.

"Bark" appearing on the surfaces of all hot rolled, cold drawn or forged steel bars has a low and varying carbon content which also varies in depth, depending on the size of the piece. Figure 4, shows the bark area to be removed from steel that is to be heat treated. Bar bark if allowed to remain will, due to its low carbon content (or none), set up stresses with the inner areas of the piece where the carbon content is higher. Stresses working against each other cause cracks and trouble.

PROPER HEAT TREAT: Since during the heat treating processes tremendous internal stresses are born, it is obvious that this operation must be done according to specifications.

As heating begins, the temperature of the steel rises to the critical point, which is the temperature above which it must be heated in order to achieve hardness when quenched. For instance, the critical point of a plain carbon steel is 1350°F and its critical range is from that temperature up to about 1400°F.

When the temperature rises above the critical point, the carbon goes into solution in the iron; in this condition steel is said to be austenitic. Austenitic steel is relatively soft, and will stay soft unless the cooling rate is controlled and the needle-like structure called martensite has a chance to form at the M-point (varies with each tool steel; the M-point for plain carbon tool steel is just under 450°F). Each steel has its own particular cooling rate to harden it properly, which is called the "Critical Quenching Speed," If steel isn't quenched at the proper temperature and with the proper medium to bring the steel down to the M-point rapidly — about 2 seconds — a pearlite will form in place of the martensite. Pearlite will Rockwell around C45, whereas you may desire Rockwell C65 or above.



FROM ROUGH MACHINE MARKS

FIGURE 3

IT TAKES MORE THAN GOOD DESIGN, PROPER STEEL SELECTION AND THIS.

Understanding that hardening takes place if the cooling to the M-point is rapid, will help us realize that too large a piece of steel will not harden all the way through. Through-hardness is not always desirable, however; in many cases a soft core with a hard skin is necessary. This can be accomplished by careful control in alloying and careful control during heat treating.

Depending on the required depth of penetration, the same effect (soft core, hard skin) can be had by carburizing a mild steel. Care should be taken in the selection of a steel (car-

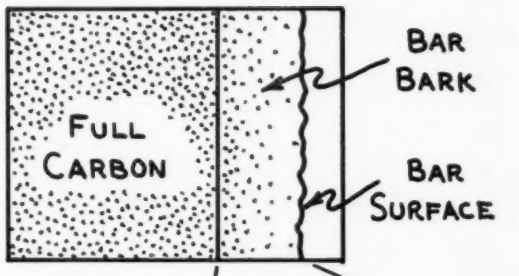
burizing or tool steel) where hardness is required for an undetermined depth. If, for instance, continual rework might take you below a layer of carburization, it would be best to use tool steel to obtain a deep skin hardness or a through-hardness.

Since failure most often starts at the outer surface of a steel, it is important that the outer surface be bathed in the proper atmosphere while being heated. For example, if a piece of high carbon steel were to be heated in a carburizing atmosphere, over-carburization would result and severe cracking would take place.

Not only must the atmosphere be controlled as to chemical content but the part must be positioned in such a way, in the furnace, that the gases may pass freely around and through it. Important also, from the circulation standpoint, is the positioning of a piece when it is quenched. Effective quenching time being so short, it is easy to see that the medium must reach all areas of a piece at as near the same instant as possible.

In quenching, the liberation of gases from the quenching medium is undesirable as this action interferes with the uniform wetting of the part . Tap water liberates its gases readily, while brine is more stable. In quenching a water hardening steel, brine will help to keep soft spots from occurring.

By alloying various elements to gain predetermined physical characteristics, the steel manufacturer sets up cooling rates, critical temperatures, and M-points for each tool steel.



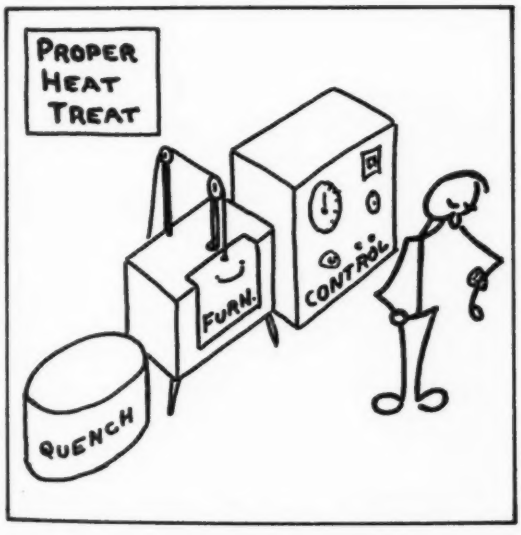
SIZE	REMOVE
UP TO ½"	1/64"
½" TO 1¼"	1/32"
¼" TO 3"	1/16"
3" TO 5"	⅛"
OVER 5"	3/16"

FIGURE 4

Variations must be studiously considered in order to obtain the results we seek.

The proportion, combination, and the processing of the elements of steel offer Industry an almost infinite choice of properties and combination of properties. With warehousing what it is today, there is no reason for using "just any steel."

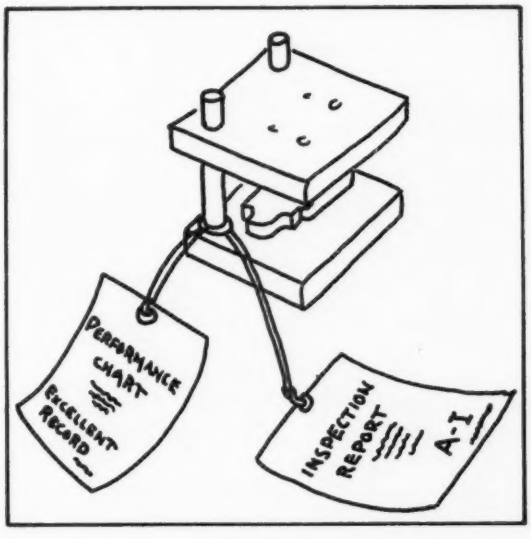
Although ordering the proper heat treat is somewhat more abstract than ordering a specific steel, there is no reason, either, to be satisfied with just the words "heat treat" as a specification. Order and expect the appropriate heat treat for the tool steel you specify. end



IT TAKES

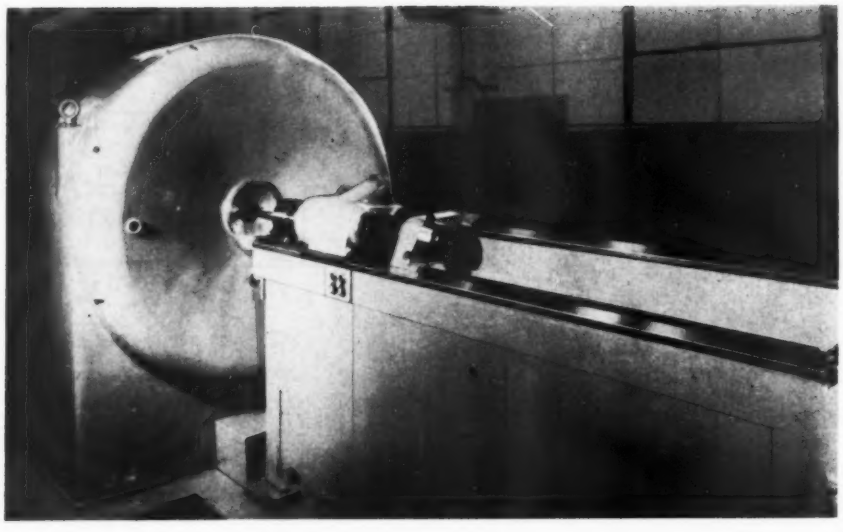
GOOD DESIGN — PROPER FABRICATION

PROPER STEEL SELECTION — PROPER HEAT TREAT



FOR THIS.

Patterned after "Four Steps To Better Tools," booklet by The Carpenter Steel Co., Reading, Pa.



Metals are kneaded or plasticized before forming in the Fellows-Appel cold forming machine.

Cold Forming Grows

as Fellows Enters Field

THE FELLOWS GEAR SHAPER Company of Springfield, Vt., has acquired the exclusive license for the United States and Canada to manufacture a machine for cold forming metals by the Appel Cold Forming Process.

Materials are kneaded or plasticized at a very low temperature — probably never in excess of 150°F — in the process. The machine transforms the original shape of the unworked material into the finished product shape by the action of the forging elements which, under control, increase the uniform circumferential pressures on the outside surface of the work with each stroke.

Both ferrous and non-ferrous materials can be cold formed by this process as long as the materials are ductile. Various types of carbon and alloy steels as well as brass, bronze, aluminum, titanium, and stainless steels have been formed.

Cylindrical pieces, where bores of close tolerances with high degree of surface are required, are most advantageously produced this way. The surface finish produced usually is 8-10 micro-inches, although a finish of somewhat better than 2 micro-inches can be obtained. Experience has proven, Fellows reports, that the 8-10 micro-inches finish is most appropriate for precision cylinders. Tubular parts with a cylindrical outside diameter where the bore has a contour, such as internal splines or square holes, are relatively easy to make.

The Fellows-Appel cold forming machine is a combination forging unit and feeding unit joined together. Work is fed into the forging unit where the dies are simultaneously forced onto the work in a direction radial to its center. The rate of feed is dependent upon the amount of deformation per stroke. The number of strokes, the feed, and the rate of rotation of the work are changeable. The selection of these is determined by the type and physical properties of the material being formed, its dimensions, the required deformation, and the shape of the deforming section of the tool-set. Changes from one size of work to another can be accomplished easily and quickly.

The three basic rules for high speed precision forging are incorporated in this eccentric operated prism machine. These include radial stroke with radial acting balanced forces; no impact forging, but time controlled kneading of the material; controlled movement of hammer elements, eliminating rebounding.

Although there are many possible uses for this cold forming machine, the company reports that its efforts will be directed for the present to its use for the manufacture of splines and shapes which are of internal nature. end

Fixturing Boosts Gun Drilling into Automatic Production

by John Leipold
Chief Engineer
TRABON ENGINEERING CORPORATION
Solon, Ohio

As told to Carl F. Benner
Associate Editor

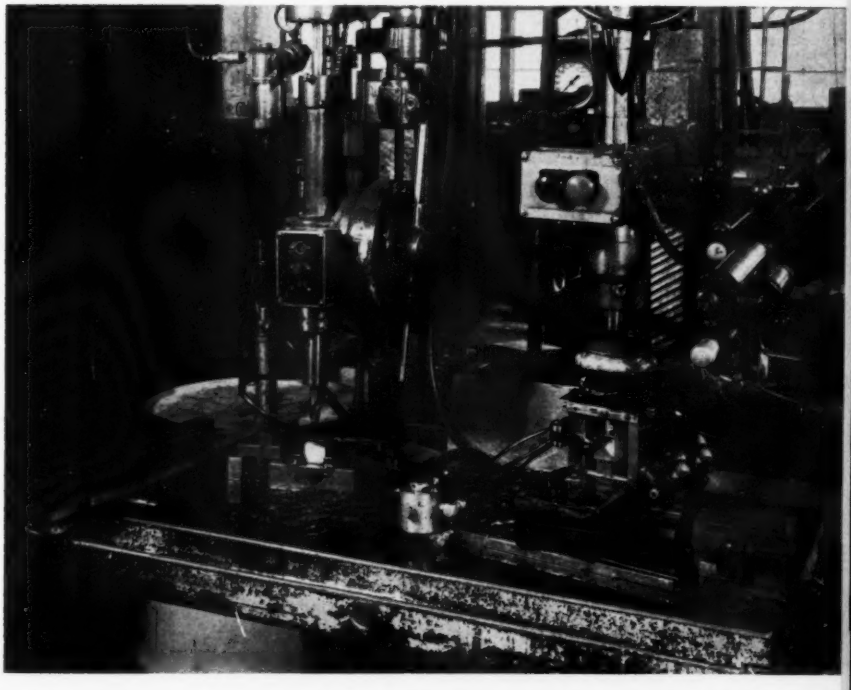
ECONOMICALLY LUBRICATING expensive machine tools is a consideration that receives special attention from the machine designer, regardless of whether it be a single machine or all the machines on an automation line.

Lubricating machine bearings manually has been the usual practice until centralized lubricating systems were introduced in recent years.

A centralized lubricating system consists essentially of a central pumping unit and a system of metering valves (feeders) connected to the pump by pipe, tubing, or hose. These valves sub-divide the lubricant from the pump and force it at required pressures into the bearing lines in pre-determined amounts according to bearing requirements.

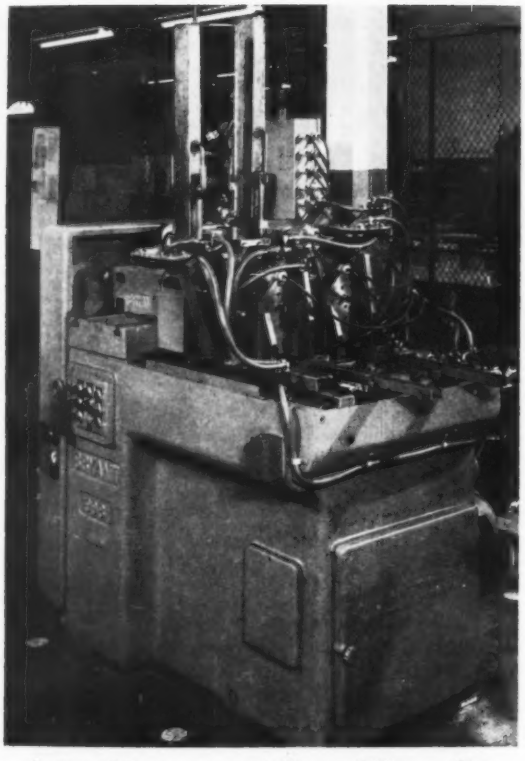
Trabon's progressive feeder operation makes it impossible to skip or underlubricate a bearing even though pressures of 2000 psi and higher are required to introduce the lubricant.

It is evident therefore that this method of lubrication is more economical and positive



A standard vertical two spindle Avey drill press is shown, on which the spindle at the right has been adapted for gun drilling. A workpiece is shown located and clamped in the holding fixture. It can be seen that the workpiece is held square in the fixture by means of the locating blocks at the bottom and right side. The drill bushing extends down close to the part so that there is a very small gap between them. This makes possible the accurate starting of the gun drill in the workpiece. Clamping is accomplished through an air cylinder and linkage as seen at the left of the fixture.

The spindle on the left works a second operation while the operator waits for the gun drilling to be completed.



A view of the new two spindle gun drilling machine, showing the fixture developed by Trabon and designed for use on a Bryant boring machine.

than the manual method because there is no waste of oil or grease, whereas by the manual method the amount applied is the oiler's guess. If he applies too much, waste occurs, if he does not apply enough or misses some of the bearings, then bearing trouble may occur.

To ensure that the correct amount of oil or grease is applied to each bearing according to its requirements, the metering equipment has to be fabricated with extreme accuracy.

The valve bodies for a typical system consist of manifolded metering valves (or feeders). The main piston bores of these valves — each of which meters an exact predetermined amount of lube when actuated — have length to diameter ratios as high as 15 to 1, and extreme accuracy is of critical importance. Both diameter and alignment are held very close in order to provide accuracy of volume metered by the unit, proof against leakage, trouble-free performance, and other attributes.

The problem in manufacturing is to attain such bore accuracy with a minimum of operations — and cost, and particularly to eliminate or nearly eliminate selective fitting in assembly.

To meet the problem, Trabon turned to gun drilling about six years ago — thereby becoming one of the pioneers in adaption of the old, old process for high speed continuous production of a non-defense item. Although the art of rifle drilling dates back at least to the "frontier marksman", this art was never converted to a high speed, high production technique until quite recently.

Experience has shown that the practical diameters of gun drills range from 0.150″ to 2.50″, although in special cases drills have been used as large as 4″ dia. The length of a gun drill can be anything up to about 250 times its own diameter.

Because the earlier gun drills used for gun-barrel bores were always fed into a rotating workpiece rather than rotated themselves, it was difficult to realize that gun drills could be rotated like other drills without losing their value.

(Fred W. Lucht, Development Engineer, Carboloy Co., Inc., made reference to rotating carbide tipped all-depth drills in the September 1948 issue of Tool and Die Journal. The general indications at that time were that long drills should not be rotated in unsymmetrical shaped or large workpieces, because an unbalanced condition may result.)

By the simple addition of a rotating fluid transfer gland to supply coolant to the rotating drill, pieces of any size or shape can be drilled on a wide variety of standard production machinery. These transfer glands are designed so that coolant is delivered in large quantities under pressure from a stationary oil supply container to the rotating gun drill.

Trabon designed and built the transfer glands which are used on the two drill presses converted for gun drilling now in use. Similar fluid transfer units are now commercially available. The first of these machines was a standard vertical Avey two spindle drill press — one spindle adapted by Trabon for gun drilling. The second one was a standard Allen three spindle drill press with one spindle adapted for gun drilling. Both of these presses are equipped with Bellows air-powered drill press feeds with Hydro-Chek control.

Successful gun drilling requires a constant uniform drill feed which is obtained with this type of spindle feed.

In converting these presses for gun drilling, a drill speed of 8000 rpm was obtained by installing a high speed motor on one spindle while the speed of the other spindles was lower for regular drilling operations. The holding fixture was designed so that the workpiece was held square and rigid and clamping was accomplished by use of an air cylinder. On these two machines the rate of spindle feed is set at 0.0005″/rev.

Comparison of the 8000 rpm drill speed for the rotating gun drills as against about 500 rpm for revolving workpieces, depending on size and shape, gives some indication of the possible advantage in the use of the rotating gun drill.

A decided advantage of rotating the drill as against work rotation is that — when the work is rotated and a hard spot in the steel is hit, the stationary drill tends to deflect and thus spoil the workpiece. This difficulty does not appear to exist with the rotating drill.

Trabon's "pride and joy" is a newly-converted horizontal, two spindle Bryant 998 precision boring machine with magazine loading and fully automatic cycling. The two drilling heads remain stationary while the table travels longitudinally.

A holding fixture designed by Trabon is mounted on the machine table. The function of this fixture is to support two magazines that will hold workpieces for about one-half hour's operations; automatically clamp the workpieces in place as they feed by gravity into place; actuate the machine table to feed the work into the rotating gun drills; reverse the table travel when drilling is completed; unclamp and eject the workpieces.

The workpieces loaded in the magazines drop by gravity to the bottom where four pieces are held as the machine cycles, the bottom piece is then ejected from the magazine base into a loading channel by an air cylinder and located in a drilling position. It is then clamped by air cylinders exerting pressure along one side and one end of the piece so that the block is held firmly against the drill bushings.

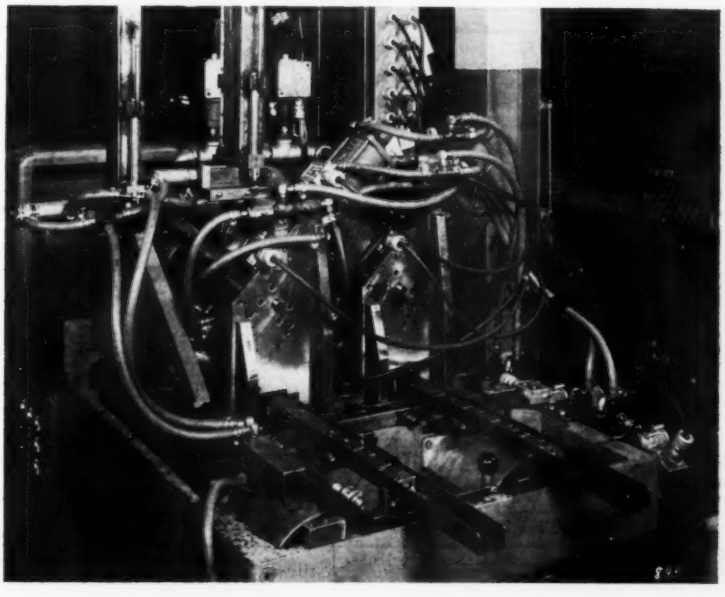
Power for clamping, unclamping, and ejection of the work is supplied by pneumatic equipment controlled through limit switches. If a piece does not locate correctly in its drilling position as it slides from the magazine, the machine is so controlled that it automatically stops.

The power for driving the boring heads and actuating the table is supplied by two electric motors located in the base of the machine. Required drilling speeds are obtained through belts and pulleys from the motor to the boring heads, the belt drive contributing to a vibration-free spindle operation. Movement of the table is provided by a hardened plate cam driven by a worm wheel with power from the cam motor. Regulation of feed rate is obtained through change gears. The feed on this machine is 0.007″/rev.

The gun drills — made by Eldorado Tool & Mfg. Corp. — are solid carbide tipped and are of a standard type with an oil hole drilled the length of the drill. The cutting angles on these drills are 15° cutting and 30° chip breaking.

The drills turn at about 7200 rpm with 5 to 7 gpm of coolant supplied through the rotating drill at approximately 300 psi.

Stationary drill-guide bushings of high speed steel are fitted into the fixture. These are purchased with ID approximately 0.0015″ oversize and honed to slip fit over a specific gun-drill. Once mated, drill and bushing are kept together — on and off the machine. Guide bushing faces must be exactly parallel and at right angles to bushing bore in order to seat properly and make a fully rigid setup.



A close-up of the fixture showing the two magazines and two unloading channels. The two drill heads operate from the rear of the machine.

The carbide tipped gun drill with oil hole extending the entire length of the drill is illustrated. The cutting angle is 15° and the chip breaker angle is 30°.

Gun drilling permits drilling an initial hole (from the solid) that is accurate within 0.0002″ to 0.0005″, that will not run-out more than 0.001″ in 6″ of length, and has a surface finish of 10 to 16 micro-inches. Holes on the converted horizontal boring machine are finished at the rate of 3″ to 5″ of length per minute. This rate has increased production 120% over the drill press method.

Experimentation and experience has demonstrated that gun drilling performed horizontally has distinct advantages over vertical drilling.

Where normally, to finish the bore, it required one subsequent honing operation, with the new gun-drill setup one broaching operation is performed for sizing only.

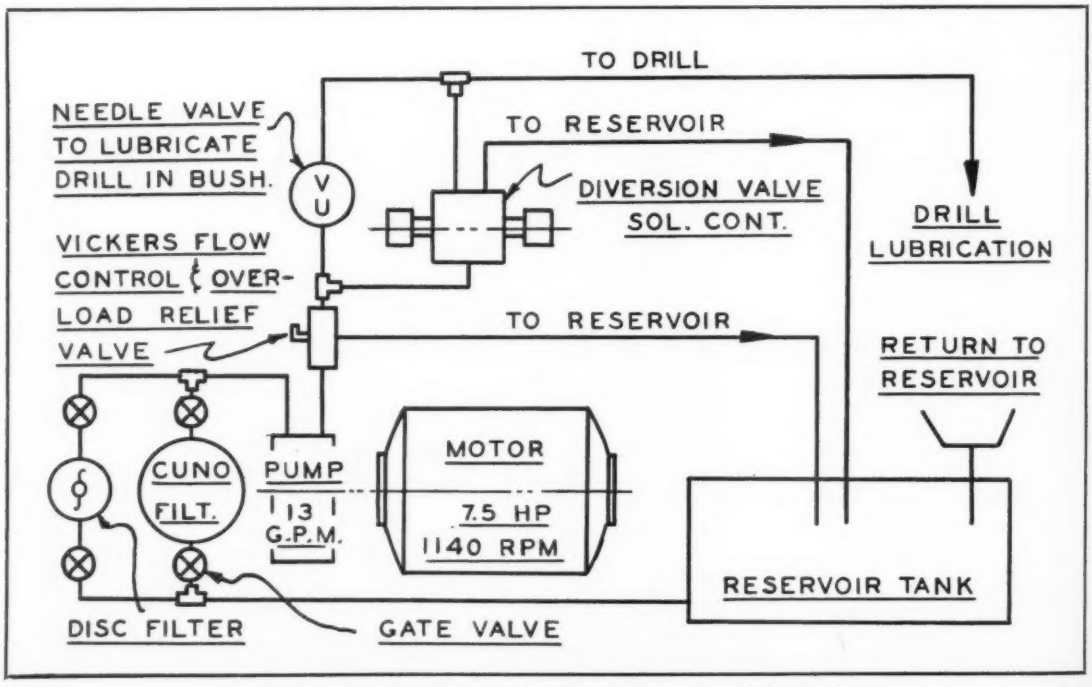
The steel used for the feeders is a relatively soft, low-carbon steel, SAE B1113 Bessemer, which has good machinability characteristics. However, the gun drilling process is not limited to soft steel.

The cutting oil used is W & B 2190 made by White & Bagley Co. This oil provides high film strength which supports the bearing surfaces of the tool and minimizes welding (burning) on the cutting edge.

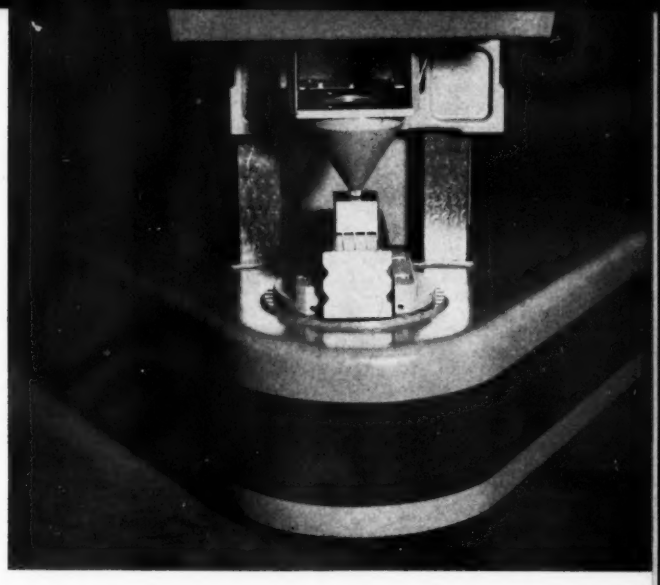
To obtain satisfactory performance from gun drills it is imperative that the coolant be of the right kind, in the right amount, and under the right pressure. end

COMING SOON

Gun Drilling with Standard Air-Feed Drill Units in Special Set-Up



A schematic view of the oil system installed on the gun drilling machines.



PLUCKING MILLIONTHS OUT OF THIN AIR

by Jack Ritchie
Applications Engineer
LINK AVIATION, INC.
Binghamton, New York

Ever since the common "boot" was averaged to obtain the lineal dimension, "foot", there has been a constant trend toward better standards and more accurate measurement. The instrument described is a new development. It is a practical industrial instrument in the field of micromeasurement intended to further extend lineal measurement accuracy by referencing dimensions to a wave length of light. Gage blocks or other secondary standards are not needed to set up or calibrate the instrument as the built-in light source is itself the standard. Simple, two-button control and a digital output reader is an operating convenience of considerable advantage.

AT THE PRESENT TIME there are three standards of length: The Imperial Standard Yard, the International Prototype meter, and the red spectral line of cadmium. The first two named physical standards are well known. The third results from the work of Michelson who in 1892, devised the interferometer and subsequently used it to determine the wavelength of the red cadmium spectral line in terms of the meter. Since the work of Michelson, there has been increasing favor toward the utilization of the wavelength of some light source as the ultimate standard of length. Its utilization makes it possible to more positively and universally define our lineal dimensions.

Many advantages obtain to the use of a light standard rather than a physical standard. Among these would be:

1. A monochromatic light source as a standard, unlike the Imperial yard stored in Britain, the International Prototype meter residing in France, or the prototype meters located at our Bureau of Standards, would be available to anyone.

2. Universal availability of the light standard would mean higher potential accuracy of measurement industrially and coincidentally a more "standard" standard.

3. A monochromatic light source under properly controlled conditions has greater constancy with time than a physical standard.

Internationally, it has already been agreed to redefine dimensions in terms of a spectral line. Under study are spectral lines of mercury, krypton, and cadmium — the choice of one of these possibly to be made in 1960. No matter which of the three is chosen, the fact remains that a single frequency light source

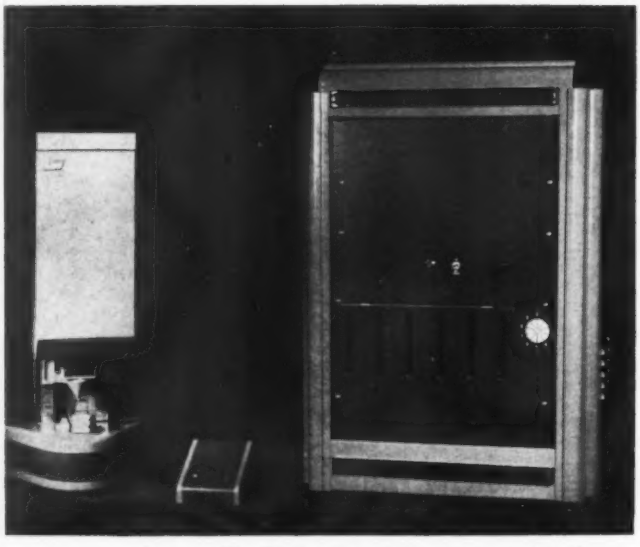


Fig. 1. The Fringecount micrometer comprises, from left to right, the interference band-generating measuring tool, the control box for xeroing the counter and actuating the up and down travel of the measuring spindle, and the electronic digital counter. The vertical columns on the counter tally the number of half wavelengths (11.5569 × 10^{-6} inches) "seen" by the phototubes as the measuring spindle travels to contact the workpiece. This value, plus any fraction shown on the ten-part oscilloscope "vernier" gives the dimension sought.

offers to industry the advantages of higher accuracy and a universality of measurement not presently available.

The Fringecount micrometer pictured in Figure 1 employs interferometry in combination with electronic digital counting. Rather than having to count or align light fringes by eye as in classic interferometers, an electronic counting system does this automatically. In establishing a dimension with this instrument, it is only necessary to read the fringe count output on the digital counter and multiply this by a figure representative of the half wave length of the light source. No secondary standards such as gage blocks are required.

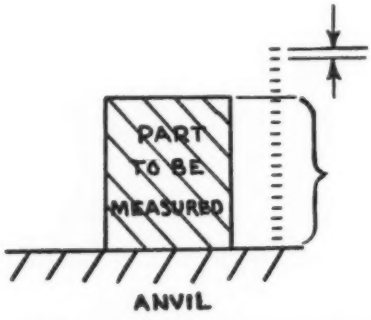


Fig. 2. The distance between any two increments is a half wavelength of the light source. Therefore, the dimension of the part is represented by a count of the number of half wavelengths "transmitted" to the counter by the spindle as it performs its measuring travel.

The monochromatic light waves in their travel through the optical system are caused to create a physical-optical standard of greater precision than a gage block. By not requiring reference to gage blocks, a very high overall accuracy is possible.

The present system of measurement standards makes use of gage blocks or other physical devices by which master-master blocks are used to establish master blocks, working blocks, and so on down to the actual measurement. As you work with these tools, the sequence of attaining your standard of measurement might be as follows:

The Bureau of Standards calibrates a supermaster block utilizing an interferometer. The gage blocks sent in to the Bureau are checked comparatively against this secondary standard to establish a block for the gage manufacturer, which becomes his master block. The gage manufacturer uses this block to comparatively check the block you have sent him which is your master block.

Your master block is used to check working blocks and the working blocks establish the dimension of the part which is what you want to measure. There are variations to this procedure but the present system of gaging, in any event, is a pyramid of comparisons. At each step inaccuracies creep in due to observation, technique, and environmental control (or lack of it).

It has been said that it is necessary to calibrate the supermaster blocks to millionths so as to assure industry of an honest dimension to ten thousandths. Inaccuracies due to differences in the pressure of measuring probes, wringing, temperature variations, and handling, all pile up as errors through the standard sequence. The prime advantage then, of a direct reference to light as a standard is the removal of the intermediate gaging sequence. Figure 2 depicts the directness (no intermediate gaging) between a succession of countable light fringes and a part to be measured.

In this instrument there is also the advantage of utilizing a direct electronic digital readout. This speeds the measuring process as compared to conventional types of interferometers and brings the interferometer out of the scientific laboratory into practical industrial usage.

One of the foremost applications of the interferometer-digital counter system is for checking and calibrating gage blocks, plug gages, balls, and other secondary standards, Figure 3. Where production tolerances are to be closely held or large numbers of gage block sets must be closely controlled, the described

equipment saves a great deal of time as well as affording accuracies to millionths. In addition, production parts themselves, within the limits of travel of the measuring spindle, may be checked directly. The Fringecount micrometer and its principle undoubtedly will find increasingly wide application in the calibration and quality control of displacement measuring devices and in special high accuracy measuring situations.

Light becomes available as a standard of measurement by means of interferometry, explained briefly as follows: A light beam, divided in two by partial transmission and reflection, is sent on different paths and reflected back so that the two beams recombine. Depending upon the relative path lengths, the light beams may recombine in a phase relationship such as to reinforce or oppose each other and thus produce light or dark bands (fringes) or an "interference" pattern.

Reference to the Schematic, Figure 4, will aid in understanding the optical principle of the Fringecount micrometer.

In effect, we have two interferometers in parallel and using the same optics. A krypton gas discharge tube is the light source. The light from it is collected at the colimating lens (made into a parallel bundle of rays) and then

Fig. 3. The Fringecount micrometer's measuring range is 2". Blocks up to 4" may be measured by reference to a previously calibrated 2" block. Preset measuring forces of 1, 4, 8, or 16 ounces are established by interchangeable counter balance weights. The throat or workpiece capacity is 3", measured from center of spindle to face of support column.

directed down toward the first beam splitter. The beam splitter reflects a portion of the incident light to a fixed prism (prism reflector No. 1) and allows the remainder to pass through it, some through the upper half which has an oxide coating and some unobstructed through the bottom half.

The oxide coating has the effect of retarding the light equivalent to a phase shift of 90° with

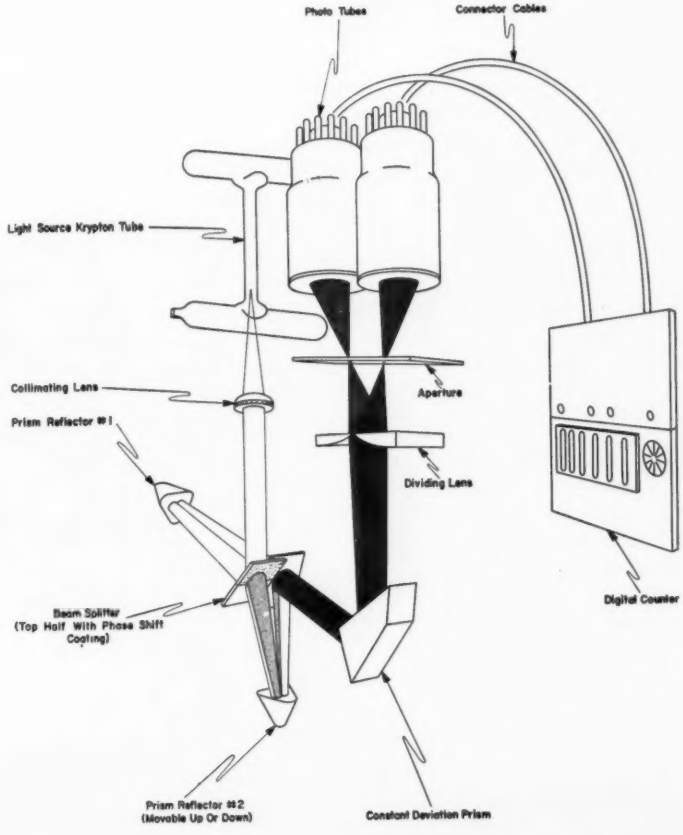


Fig. 4. The optical system. Basically, two light paths: one from the light source to the phototubes via prism reflector No. 1, and the other from the light source to the phototubes via prism reflector No. 2. The two light paths combine and cause an interference at the right hand beam splitter. As prism reflector No. 2 moves up or down with the measuring spindle travel, a succession of interference fringes is "generated" at the right hand beam splitter because of the lengthening and shortening of the light path through prism reflector No. 2. It is this succession of light fringes which is "seen" by the phototubes and tallied by the digital counter.

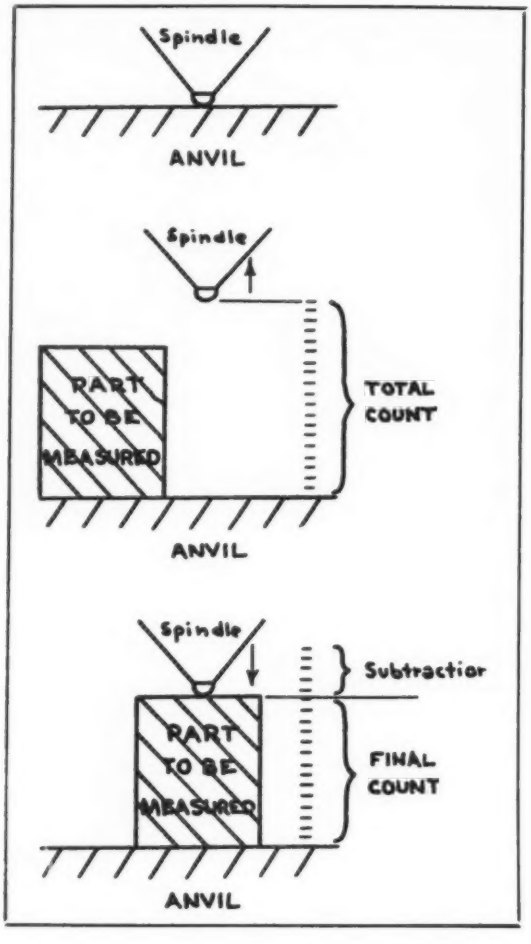


Fig. 5. The measuring procedure, depicted from left to right consists of zeroing the counter by bringing the spindle down to the anvil, as indicated at the left. Next, the spindle is raised to adequately clear the workpiece. As the spindle goes up, the counter is counting fringes to the tune of total spindle travel. The workpiece is then positioned under the spindle and the spindle is travelled down to contact. During the down travel of the spindle the counter subtracts fringes. Thus the final count is of the total number of half wavelengths of the light source equivalent to the dimension of the workpiece.

reference to the unretarded light and, as will be further shown, allows two things to be accomplished. It allows us to divide a half fringe into smaller increments; and second, it is a means of telling the electronic counter which way it should be counting, up or down.

Light emitted from the light source and as retarded by passing through the coated portion of the beam splitter is directed down to prism reflector No. 2. This prism is directly attached to the measuring spindle and is moveable just like the Michelson or other types of interferometers. Reflected from prism reflector No. 2 and redirected up to the second beam splitter, two interference patterns are produced in combination with the light reflected from prism reflector No. 1. The two interference patterns, 90° displaced from each other because of the coating on the upper half of the first beam splitter are next directed through the constant deviation prism. From there a dividing lens separates the two patterns, and the yellow lines of krypton are picked off at the aperture plate and then introduced to the two phototubes.

Therefore, the only moving optical part is prism reflector No. 2. The only moving mechanical parts are those that support this prism. Prism reflector No. 2 is directly connected to the measuring spindle so that when the spindle stops in contact with the anvil or a workpiece, the prism stops, too. When the spindle moves, the prism moves.

Thus that portion of the light paths which enters and leaves prism reflector No. 2 varies in length as compared to the portion of the light paths which does not enter prism reflector No. 2, but is confined in path to reflection from the first beam splitter, to prism reflector No. 1 (always stationary) and to the second beam splitter where it meets up with the light path coming from prism reflector No. 2.

Consequently, as the measuring spindle (and prism reflector No. 2) is moved, a succession of interference fringes will be presented to the phototubes for counting. As prism reflector No. 2 moves up the counter counts in a positive (additive) direction. As prism reflector No. 2 moves downward, the counter counts in a negative direction or subtracts.

What the phototubes see therefore, are two interferences each phased from the other by 90°. As the measuring spindle and consequently the prism reflector No. 2 move up and down, each phototube sees a light of varying intensity corresponding to the interference. This change in intensity is detected by the phototube, amplified, converted to a pulse and presented as a count to the bi-directional digital counter.

As previously stated, there is a 90° phase relationship between the fringe pattern as received at the two phototubes. This scheme, firstly, gives the electronic circuit a sense of direction. Depending upon which of the two electronic pulses the counter receives first it knows whether to count in an increasing or decreasing direction. Secondly, the 90° phase relation allows us to fractionate a half fringe. This is done by introducing the phototube pulse outputs to the horizontal and vertical plates of a cathode ray tube. Since the two voltages are 90° out of phase (as are the two optical interferences) a circular pattern is generated by a spot on the oscilloscope and one full rotation of the spot corresponds to one half

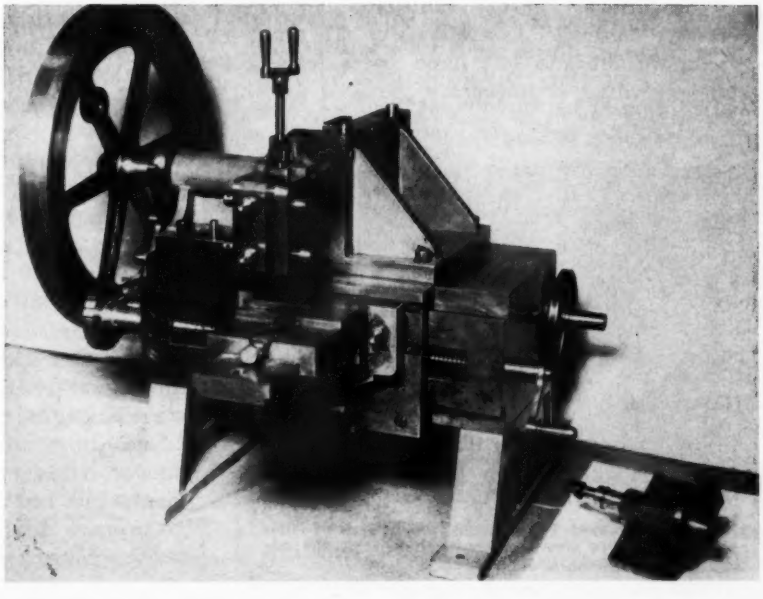
fringe. Wherever the spot stops in its 360° path as a measurement is made, corresponds to that portion of a half fringe. By marking the tube face with a grid or "vernier", Figure 1, it is then possible to divide the half fringe into ten parts.

Operation of this particular interferometer is very simple as it has only two controls, a "zero set" push button switch, and an "up-down" switch to actuate the motor driven measuring head. To make a measurement, as shown schematically in Figure 5, the spindle is driven down to make contact with the anvil by actuating the "down" button on the control box. When the spindle is in contact with the anvil, with the preset contact pressure, the zero set button is depressed zeroing the counter — that is reducing all the numbers to zero. The spindle is now raised by moving the "up-down" switch to the "up" position, until there is sufficient clearance for the workpiece to be measured. The workpiece is then positioned on the anvil and the spindle is then brought down in contact with it (at the same pressure as when zeroing) and the counter read. The reading on the counter times the half wavelength of the light source (11.5569×10^{-6} inches) plus any reading on the oscilloscope vernier, gives the dimension.

It is well to remember that any high accuracy measurement must be made in an environmental atmosphere controlled to an extent consistent with the accuracy demanded. Wide temperature fluctuations for example, will change the dimension of the part undergoing measurement and consequently will negate the inherent accuracy of the instrument. An instrument such as the Fringecount micrometer will however, reduce the overall inaccuracies contributed by measuring environment and technique over the present echelon of gage block standards since the measurement is made but once rather than many times with resultant compounding of errors and the reference is the wavelength of a monochromatic light rather than a physical standard.

Fundamentally the Fringecount micrometer is a transducer with a digital readout. There is no reason why the basic scheme described here could not be applied to other situations where accuracy and direct digital output, without conversion from analog form, are desirable. Automatic measuring and sorting machines for checking parts, cams, and contours can presumably be developed utilizing this system. Two such interferometers could be combined for accurate X-Y positioning. As with many other developments of the atomic age, the advantageous application of this optic-electronic scheme has only begun to be exploited. **end**

TIME TO RETIRE!



The shaper was invented by James Nasmyth in 1836. This is a replica of the model built by Nasmyth himself for London's Science Museum. The first shapers were long known in England as "Nasmyth's steel arm". The quick return motion was added later by Whitworth.

Editor's Note: If you are using any of these in your plant, we suggest that you run—don't walk —to your nearest machine tool distributor. He has news for you!

Photo courtesy New York Museum of Science and Industry.

TAPE-CONTROLLED TABLE MODERNIZES EXISTING MACHINES

EXISTING MACHINE TOOLS with automatic spindles have many of the same time and money-saving advantages as newer automatics when automatic, tape-controlled positioning tables are used in conjunction with them.

One such table (Fig. 1), developed by Allison Equipment Co. to fill the need for a precision, portable, and easy-to-operate positioning unit, is adaptable to nearly any machine tool. It has been applied successfully to an engine lathe.

Table motion, which is controlled by magnetic tape, is along two perpendicular axes in a horizontal plane. Travel at 45° angle to these axes is produced by electrically connecting the two axes during recording. Overall table dimensions are 50″ x 35″ x 15″ high, and maximum table thrust is 1,000 lbs. Its range of motion is 20″ x 10″.

With complete tape recording switched on, the machine operator just places a blank on the machine and starts the sequence for each part. This allows one unskilled operator to run several machines and minimizes rejects resulting from human error.

Milling can be done, in addition to stationary part operations, because table motion and speed are controlled continuously. To make matching right and left hand parts from a single recording, switches are provided to reverse all movements of either axis. Other control switches (Fig. 2) are provided to allow the operator to stop the automatic sequence while a part is being made to inspect drill sharpness, depth of setting, etc.; and to re-start the tape automatically immediately after rewind for making a series of small parts strung out along the table top.

Fig. 1. Directions recorded on magnetic tape position the table to give existing machine tools the advantages of automatic control.

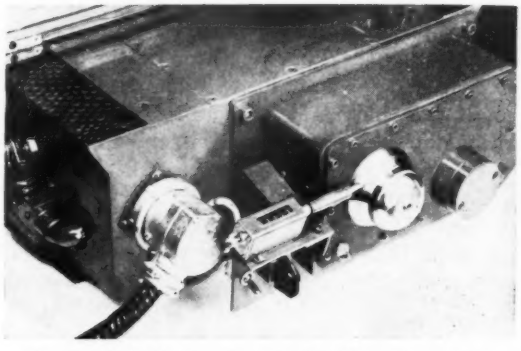
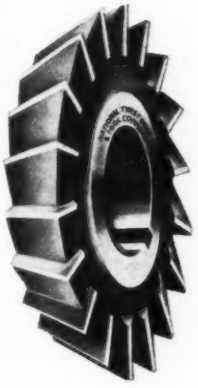


Fig. 2. Switches on the recorder allow the operator to stop the automatic recorded sequence to inspect parts, change tools, etc., while parts are being made.

The tape handler accommodates reels up to 14″ dia., which hold enough recorded information for 40 min of table running time. Seven channels of information are recorded on the ½″ tape — four produce table motion; one stops tape during machining; one controls spindle movements of the machine to which the table is attached; and one rewinds tape when a part is finished. Although most recording is done by manual operation of the table, tapes can be prepared for milling circles, arcs, and odd shapes by using special recording equipment.

The small job shop may find it convenient to buy pre-recorded tape sections for movements not readily recorded and splice them into a recording rather than invest in more complicated recording equipment.

Recordings can be stored for future production, or, if no further parts are to be made from them, tapes can be re-recorded for other parts. To prepare duplicate tapes, receptacles to tie two machines together have been provided. *end*



FORM MILLING CUTTERS

. . . their Design and Application

by Carl J. Oxford, Jr.
Research Engineer
NATIONAL TWIST DRILL & TOOL COMPANY
Rochester, Michigan

WHEN MILLED WORKPIECE SURFACES cannot be positioned so that they are either parallel or perpendicular to the cutter axis, some type of form milling cutter must be used. The simpler form cutters are those used for producing an angle or a radius, while more complex types are required for the intricate shapes of plier and wrench jaws or the variable curvature of gear teeth and supercharger rotors.

Form milling cutters are made in two different styles according to the method of sharpening. These are known as profile sharpened cutters and form relieved cutters. The essential features of profile sharpened and form relieved cutter teeth are compared in Figure 1.

Profile sharpened cutters are sharpened by grinding the relief surfaces of the cutter teeth. This means that the milled workpiece profile must be reproduced on the cutter teeth each time they are resharpened. The advantage of this type of cutter is that it can be made with a greater number of teeth and the relief angles can be adjusted to suit various workpiece materials and operating conditions. Hence, the profile sharpened cutter is a very desirable type where it can be used. However, the type of sharpening usually limits its use to relatively simple shapes such as an angle or a radius.

Form relieved cutters are made on a special relieving machine, which controls the movement of a form tool or formed grinding wheel so that the desired profile and relief angle are produced on the tops and sometimes the sides of the individual cutter teeth. Since the relief angle is built into the cutter, sharpening is accomplished by grinding the faces of the teeth.

Thorough analysis of a form milling operation will indicate the best type of cutter for each application. For the cutter designer to analyze such operations and recommend optimum cutter design, he must have complete information regarding the workpiece profile and the milling setup to be used.

Reprinted from "Metal Cuttings" published by National Twist Drill & Tool Company.

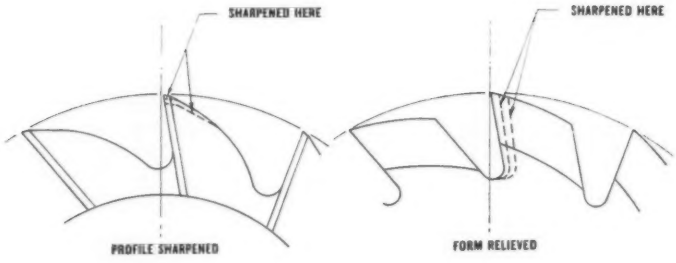


Fig. 1. Comparison of profile sharpened and form relieved cutter teeth. For purposes of comparison both cutters have the same number of teeth, the same rake angle and the same relief angle. The profile sharpened cutter is shown with side cutting edges which are sharpened in the same manner as the peripheral cutting edges.

This construction usually requires that the cutter be made with fewer teeth than profile sharpened cutters to allow for sufficient sharpening life along with adequate chip space and backing for the cutting edges.

Form relieved cutters are well adapted to the application of hard case surface treatments, since the relief surfaces, where the treatment does the most good, are not ground away in resharpening.

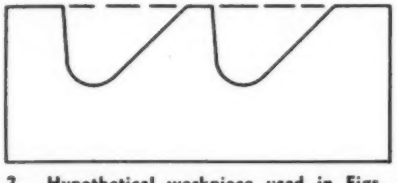


Fig. 2. Hypothetical workpiece used in Figs. 3-5. Dashed lines show shape of piece before milling.

While there are few limitations on the profiles which can be incorporated in form relieved milling cutters, not all form relieved cutters of conventional design are successful milling cutters. This is because the effective relief produced on various form elements by radial form relief is not constant. In this discussion, effective relief refers to the relief angle measured normal to a cutter form element. It is this relief angle which determines the width of wear land produced by a given amount of cutter wear.

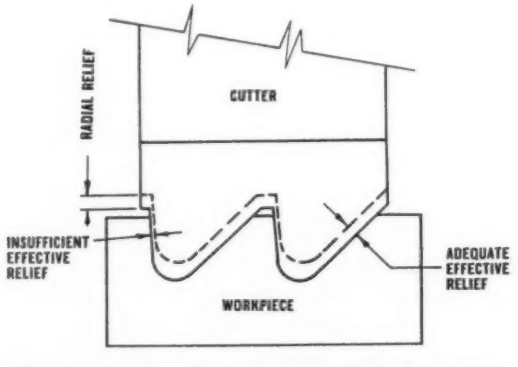


Fig. 3. Cutter with conventional radial form relief is not satisfactory because of insufficient relief on form elements nearly perpendicular to cutter axis. Solid lines show cutting edges while dash lines show a section through cutter teeth at some angular distance behind cutting edges.

With radial form relief, the effective relief decreases as the form elements depart from parallelism with the cutter axis. Elements parallel to the cutter axis have maximum effective relief, while elements which are perpendicular to the cutter axis have no effective relief. This can be demonstrated by considering cutters for the simple double workpiece profile shown in Figure 2. Each of the forms is made up of three elements: a surface nearly perpendicular to the workpiece surface; a surface appreciably inclined to the workpiece surface; and a radius surface joining the other two surfaces.

A cutter of conventional design for the workpiece of Figure 2 is shown in Figure 3. Note that there is considerable effective relief on the angled portion of the cutter teeth, but very little relief on the portion of the teeth which are nearly perpendicular to the cutter axis. With this design, there would be an excessive amount of wear on the near perpendicular portions of the cutter teeth as dulling progresses.

If the workpiece of Figure 2 can be held in a tipped milling fixture, a satisfactory form relieved cutter can be made. This is shown in Figure 4. Here, there is adequate relief on all elements of the cutter teeth. Since the tipping of the form increases its depth, the use of larger cutters may sometimes be required.

When the workpiece cannot be tipped, a

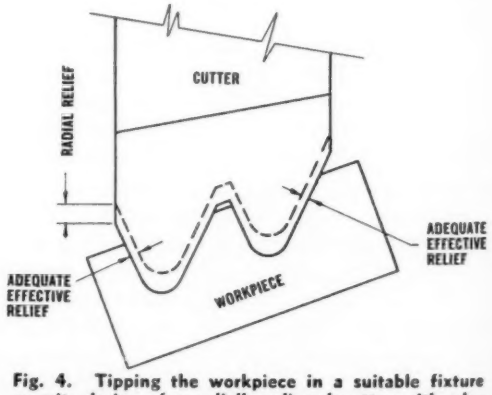


Fig. 4. Tipping the workpiece in a suitable fixture permits design of a radially relieved cutter with adequate effective relief on all cutting edges. Note that the relief on some parts of the radius is greater than that on the straight form elements.

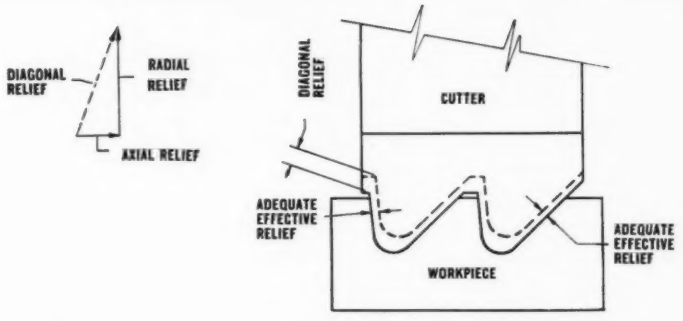


Fig. 5. When the workpiece cannot be tipped the cutter can be made with diagonal form relief by combining axial and radial relief as shown in the vector diagram. Note that the cutter form shifts axially as the cutter is sharpened.

more complex type of form relieved cutter will give good performance. This type of cutter is made with combined radial and axial relief as shown in Figure 5. The vector diagram with the sketch of the cutter and workpiece shows how axial and radial form relief are combined to produce diagonal form relief on the cutter. Note that when this style of cutter is resharpened, the form moves axially along the cutter,

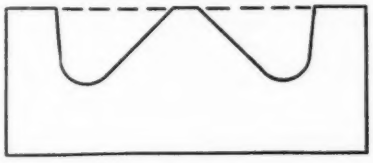


Fig. 6. Workpiece with one form reversed, See Fig. 7 for cutter design.

therefore the cutter must be repositioned in relation to the workpiece each time it is resharpened. The cutter must be made somewhat wider to allow for this axial shift of the form. The combined axial and radial relief permits the design of a cutter which will have good wear life.

If half of the workpiece form were reversed, as shown in Figure 6, the use of combined radial and axial relief would no longer be feasible since axial relief in opposite directions is required on each side of the cutter. The same result can be achieved by splitting the single cutter into a pair of cutters, ganged as shown in Figure 7. Each of the cutters is made with axial relief in opposite directions. Upon resharpening, the width of this cutter gang is reduced because of the axial relief. Thus, progressively thicker spacers must be installed between the two cutter sections as they are resharpened in order to maintain the workpiece dimensions.

If the flat between the two forms of Figure 6 were reduced in length—or if the two forms met in a sharp point as shown in Figure 8—a further complication would be introduced. The two-piece construction of Figure 7 would be inadequate because there would be no allowance for resharpening. This problem is solved by interlocking the two halves of the cutter as shown in Figure 9. The teeth on one half fit between the teeth on the other half. This construction allows for resharpening and makes possible the attainment of a sharp corner at the intersection of the two forms. Such interlocking to maintain a sharp corner is often done since the minimum radius which can be held at the intersection of two lines on a form relieved cutter is of the order of a few thousandths of an inch.

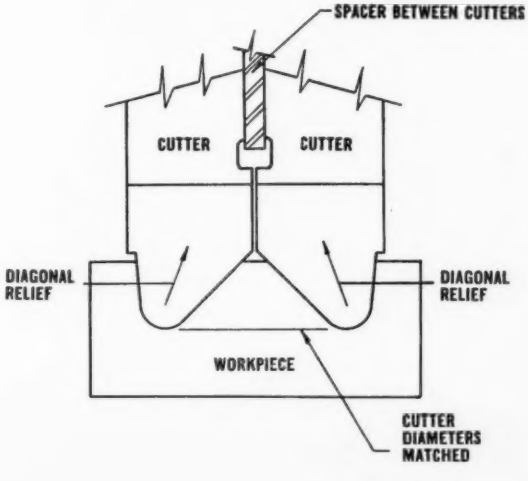


Fig. 7. Two cutters with opposite diagonal form relief are ganged to produce the part shown in Fig. 7. Note that width of spacer between the cutter must be increased to maintain workpiece dimensions as the cutters are resharpened.

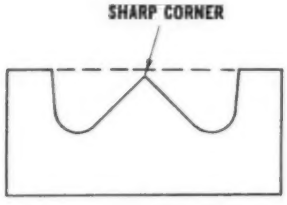


Fig. 8. Workpiece with two forms intersecting in a sharp corner. See Fig. 9 for cutter design.

These examples show only the general principles involved in modifying the design of form relieved cutter to provide adequate cutting relief. Some of the principles demonstrated can be applied also to profile sharpened cutters. For example, the use of ganged cutters would make possible the manufacture of cutters as shown on Figure 7 and 9 in profile sharpened type. The cutter shown in Figure 5 could also be made in profile sharpened type if it were split into two ganged cutters. This would permit the cutter to be sharpened on conventional profile cutter sharpening equipment. As the forms become more complex, though, form relieved cutters would greatly simplify cutter sharpening.

end

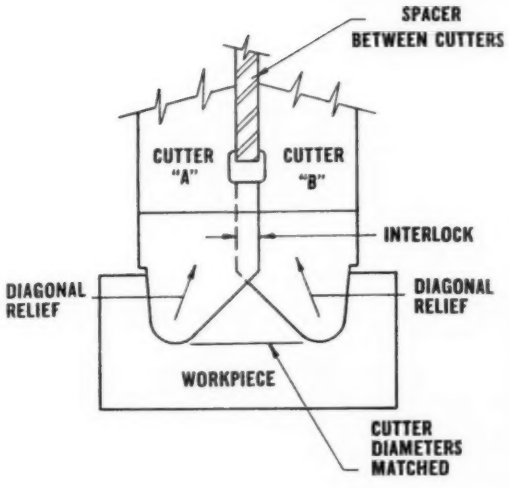


Fig. 9. Interlocking cutters with diagonal form relief for the part shown in Fig. 8. The mating sides of the cutters are recessed so that the teeth of cutter "A" fit between the teeth of cutter "B". The spacer allows adjustment of the cutter gang width in resharpening in the same manner as the cutters shown in Fig. 7.

TRADE TEAM MEMBER NOTES
YUGOSLAV INDUSTRY LAGS

Jack Kleinoder

Yugoslavian industrial development lags some 15 to 30 years behind the United States; and the machine tools now being built there compare roughly in design and size with our pre-war models. These are the observations of Jack Kleinoder, general manager of Volkert Stampings, Inc., Queens Village, N. Y., who just returned from visiting Yugoslavia as a member of a four-man Department of Commerce trade team.

He returned from the Soviet satellite with the opinion that the U.S.S.R., too, has a way to go to match U.S. machine tool production and engineering efficiency. His interviews with engineers at the Russian pavilion at the Zagreb Trade Fair are somewhat contrary to the numerous reports that Russia is outstripping this country in training engineers.

The plants visited by the trade mission, says Mr. Kleinoder, presumably represented the best ones in the country, "but their methods and production equipment equal ours of the pre-World War II period." The group toured woodworking plants, motor and turbine producing facilities, small appliance plants, and machine tool factories.

New Yugoslav machine tools appear patterned after small and medium sized U. S. machines, but of 1940 vintage, he reports. High precision work was not seen, and where such parts were reported required they had been imported from other European countries.

Living conditions in Yugoslavia are below the standard of Western European countries, and far under standards to which Americans are accustomed. In the plants, materials handling operations which are mechanized in U. S. plants are carried on by swarms of workers. "Labor is cheap", with an average national income the equivalent of about $1 a day."

Industry works for the government in Yugoslavia, observed Mr. Kleinoder. There are no strikes nor slowdowns. Yet productivity is low because of inadequate equipment and outdated methods. One big drawback, he believes, is insufficient electric power, "a situation Tito is trying to improve."

Plant managers are invariably Communists, faithful to their cause. But even these men are poorly paid — a month's salary will buy a suit. In the city of Belgrade there are probably 25 privately owned automobiles. Hundreds more are on the streets, but they are government or plant-owned. Most Yugoslavs, Mr. Kleinoder reflects, would settle now "not for a car in every family — just a bicycle."

Copper and aluminum are now being processed and exported there, but progress is limited by the lack of modern mining equipment, production techniques, and engineering.

At the U.S.S.R. pavilion at the Zagreb Trade Fair, Mr. Kleinoder talked with Russian engineers and found out that of some 20 modern, impressive Soviet machine tools on display, only three were actually in production and available on the open market. The others, he learned, were experimental models. This information and other impressions gained in his visit to the Russian pavilion, strengthened Mr. Kleinoder's belief that while Soviet Russia may be turning out engineers rapidly, they are not of the caliber of our engineers.

There is considerable Western influence in evidence in Yugoslavia's relatively young industry, Mr. Kleinoder says. German equipment left in the plants after the war, and reparations and Western lend-lease help since that time, have made the country alert to Western ideas. In addition, Yugoslavian businessmen who have visited the U. S. have been extremely favorably impressed. More such visits should be encouraged by U. S. businesses, Mr. Kleinoder believes.

PRODUCTION DATA NOW AUTOMATICALLY RECORDED

AUTOMATIC COLLECTION of production data at the source of manufacturing operations is now feasible, due to IBM's new automatic production recording system. It can express itself both in machine and human language.

This fast, flexible system is able to collect, correlate, store and record accurate up-to-the-minute production data on punched tape and cards, while printing out reports for supervisors on automatic typewriters located along the production line. The card and tape media, containing such variables as weight, count, length and temperature, together with related information identifying the product and process, are used as input to accounting machines.

The system provides immediate, current information such as the number of motors produced, the number that passed inspection, the total productive hours, non-productive periods by season or code, and the date of the month. In addition, quality control and production control are greatly facilitated through the system's use in noting the trouble with the motors that failed to pass inspection and giving hourly reports on production, rejection and repair rates.

Information is prepared in a form compatible with data processing machines even as the production process is underway. At the same time, the typewritten reports keep supervisory personnel up-to-date, thereby increasing their effectiveness. The maximum output rate on tape or typewriter is about ten characters per second.

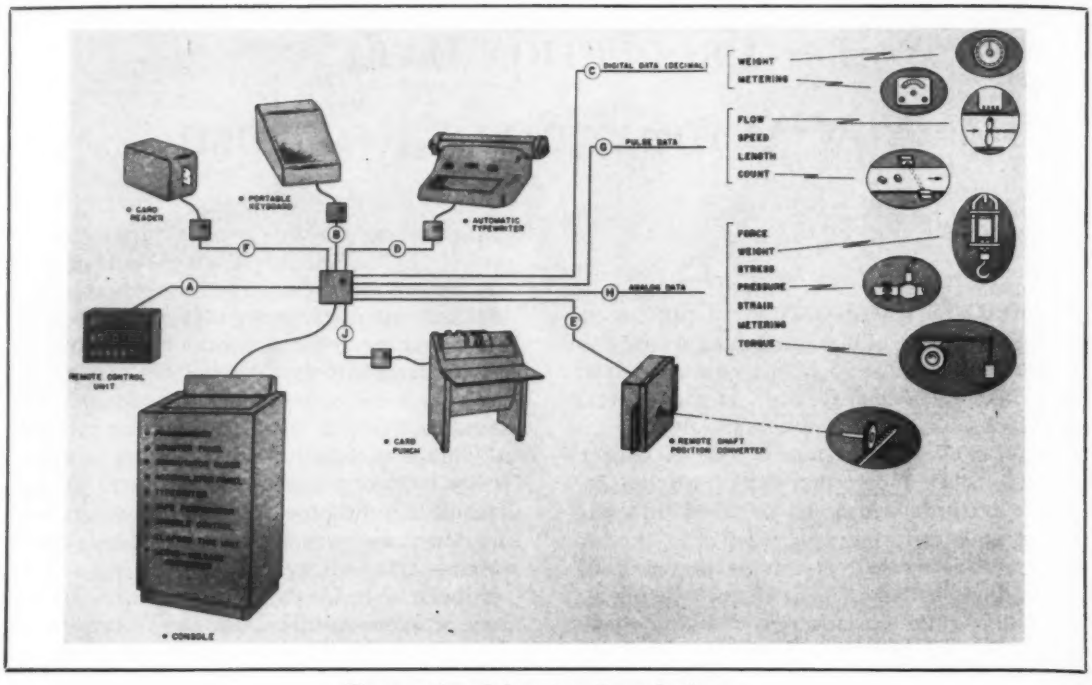
The flexibility of the system stems from 16 basic components, or "building blocks," which include automatic and manual input units, prepunched card readers, printing card punches, control console, accumulator panel, and remote typewriters. The components needed are based on the number of production points to be covered and the nature of the manufacturing operations.

Measurements made by mechanical or electronic sensing devices, strain gages, thermocouples and other variable voltage devices are read electrically before being converted to digital or numeric form suitable for input to the storage unit, or for output by the tape perforator, card or automatic typewriter. An on-demand or time programmed read-out can be initiated at any stage for visual display of data which is being accumulated in storage.

Non-variable identifying data, such as machine and man number, can also be introduced into the system from rotary switches on the console. This material can also be initiated by remote control panels, by portable keyboards, or by card readers which read data from IBM pre-punched cards.

The functions of storage are performed by counter panels and accumulator panels which count and store impulses representing measurable data. The heart of the system is the programmer which coordinates the flow of information from the input and storage elements to the output units to provide printed and punched records for the particular application.

This console control unit, a functional input and control component of the production recording system, permits the manual introduction of production line data into the system. It also indicates various factors of system status and permits pushbutton initiation of system functions.



The operation of the automatic production recording system is here shown schematically.

Output is recorded either by an automatic typewriter, a card punch or a tape perforator. The typewriter makes a printed record of current production information for on-the-spot use. The tape perforator produces five-channel alphanumerical punched tapes, which are automatically converted to IBM cards when processed by tape-to-card punches.

The tapes contain complete instructions for directing the tape-to-card punches as well as the codes that represent data to be punched into the cards. A reel 8″ in diameter, containing about 300′ of paper tape, will hold punched information equivalent to about 350 eighty-column IBM punched cards.

Tape-recorded information also can be transmitted over regular telegraphic systems from one location to another. This feature is used when a company with centralized data processing facilities has a number of factories at widely separated points.

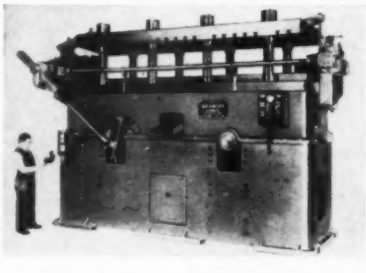
The IBM automatic production recording system is designed to provide a new link in efficient industrial handling to meet the varied data collection needs for industry quickly and accurately. The core of its usefulness is the ability to produce punched tapes and cards for use by industrial machines, and typewritten reports for immediate use by personnel in the production area.

end

NEW DOUBLE CRANK PRESS DESIGNED FOR HIGH PRODUCTION

A new standard 450-ton double crank Brandes automatic press built for use in the production of the dual headlight bowls for 1958 automobiles, is the largest press of its type built to date. It will take a die 170″ long and 36″ wide and gives high production between grinds.

Unique Brandes design features assure even pressure at all die stations through the use of 8 guided draw rods and 8 vee-way guides built into the base of the machine. Tipping under load is held to a minimum with top platen held parallel with bed to 0.002″. Both cranks are evenly synchronized with balanced thrust loads.



Brandes standard double crank progressive die presses, built by the Brandes Press Co., are available in sizes from 100 to 4,000 tons with design features offering maximum production efficiency for specific installations. Strokes are available up to 24″, permitting an unusually deep draw. Ample space is provided for die cushions on the top platen, as well as for die cushions inside the press.

MYTHS AND FALLACIES OF AUTOMATION

by James R. Bright
Associate Professor
Graduate School of Business Administration
HARVARD UNIVERSITY

AUTOMATIC MANUFACTURING is an exciting prospect to many engineers and managers in metalworking. It has proved its ultimate benefit many times, yet it is a simple truth that we have been so deluged with cliches about the impact of automation that it is very easy to be misled as to what to anticipate. The unqualified assumption that these things will inevitably accompany any automation effort is dangerous and misleading. It clouds the judgment of both engineers and managers, and it misleads and disturbs labor and the general public.

During the past two years I have had the opportunity to study in some detail the experiences of 13 highly automatic production systems in a variety of industries. The trends and results seen there have been checked against the experiences of perhaps another 30 firms in lesser detail. When we examine these industries carefully, instead of hypothesize, the lessons of automation stand out much more clearly. The cliches with which automation speeches and literature abound are true enough — but only in part and only under certain conditions.

The process industries, and particularly oil refining, have gone much further toward automatic operation than the metalworking industries. By studying things that have happened in these firms we can, perhaps, interpret and anticipate some of the ultimate effects of mechanization in the automotive field. Let us look at some of the more common myths and fallacies of automation.

Myth No. 1 — That there are fully automatic factories. It has been stated again and again in popular and serious literature that there are not only "automatic" factories, but there are "fully automatic" factories. For three years I have tried to track down such automatic factories and have been unable to find them. The automatic factory turns out to be a remarkable advance in mechanization, but it has not resulted in manless production. It also turns out to be a tremendous hodgepodge of semantic confusion and exaggeration.

Before we can correctly describe a plant as being "automatic," we must agree on:

- What activities must be mechanized.
- Over how much of the manufacturing cycle the mechanization must extend.
- How far back into the secondary operational and conceptual activities the mechanization must extend.
- Exactly what kind of human contribution to the plant and machinery, if any, may be permissible and still allow the system to be called "automatic."
- What kind of mechanical performance is "automatic."

Since such agreement or definition is nonexistent (and probably impossible), everyone is at liberty to use "automatic" and "automation" to mean any kind or amount of mechanization he chooses. And he does! The result is the grand confusion we now have in which "automatic factory" and "automated plant" mean just about anything at all in the way of an outstanding mechanization achievement.

It is clear that we need a better understanding of the nature of mechanization. Figure 1 shows the 17 levels of mechanization which I have derived. Whether this or some other method of establishing degrees of difference in mechanization is adopted, we might take such a ranking and apply it to every action in the factory, from receiving dock to shipping dock.

We would then create what I have called a *Mechanization Profile*, which will show the level at which each activity is performed and how the level varies from action to action. A portion of a typical mechanization profile is shown in Figure 2. Through such an analysis it is evident that mechanization has at least three important qualities which must be understood to discuss intelligently the spread of automaticity, such:

1. There are many levels or degrees of sophistication in mechanical action. These vary widely from operation to operation. Automaticity seems to increase in richness of response as the higher levels are employed.

2. Mechanization also has a quality which I have described as "span." When the production system as a whole is studied, we see that mechanization appears in a very spotty manner. There are "clusters of automaticity" around certain activities, but the span of this mechanization definitely is not comprehensive from door to door. For instance, even in those plants where movement is completely mechanized and automatically controlled, as in an oil refinery, functions such as maintenance, sampling and data logging are not done automatically (although progress is being made in this direction).

From such studies we can appreciate that automatic manufacturing or automation itself, no matter what definition the enthusiast chooses to apply, becomes a matter of degree of mechanical sophistication and of the addition of more functions to the mechanization sequence.

While amazing and highly creditable technical accomplishments have created plants that are noteworthy for their degree of automaticity, it is still *a matter of degree*. The vast majority of so-called automatic plants have a substantial number of employees. The fully-automatic factory is still a myth and appears to a very limited industrial concept.

3. The prevalence of automatic production throughout an industry is a third aspect of its impact. There is a tendency to take a few exceptional plants and assume that they are typical when they are anything but!

Myth No. 2 — That automatic manufacturing requires feedback control. If we define feedback as the regulation of a machine by its own analysis of its output (closed loop control) we find that there is either none or remarkably little of it in most automatic production machines. This can be proved by taking a number of automatic sequences and examining them step by step to see if and where feedback appears. I have examined several hundred automatic machines in about 30 highly automatic production systems and found only oil refineries to show a significant amount of feedback control.

It is true that much automatic machinery does use elaborate and intricate electrical, hydraulic, pneumatic, or electronic control systems. These systems, however, are largely programming devices: they guide or

Adapted from a paper presented at the Society of Automotive Engineers' Annual Meeting in Detroit last month.

Initiating Control Source	Type of Machine Response		Power Source	Level Number	LEVEL OF MECHANIZATION
From a variable in the environment	Responds with Action	Modifies own action over a wide range of variation	Mechanical (Non-Manual)	17	Anticipates action required and adjusts to provide it.
				16	Corrects performance while operating.
				15	Corrects performance after operating.
		Selects from a limited range of possible prefixed actions		14	Identifies and selects appropriate set of actions.
				13	Segregates or rejects according to measurement.
				12	Changes speed, position, direction according to measurement signal.
	Responds with Signal			11	Records performance.
				10	Signals preselected values of measurement. (Includes error detection)
				9	Measures characteristic of work.
From a control mechanism that directs a predetermined pattern of action	Fixed within the machine			8	Actuated by introduction of work piece or material.
				7	Power Tool, Remote Control.
				6	Power Tool, Program Control (sequence of fixed functions).
				5	Power Tool, Fixed Cycle (single function).
From Man	Variable			4	Power Tool, Hand Control.
				3	Powered Hand Tool.
			Manual	2	Hand Tool.
				1	Hand.

Fig. 1. Levels of mechanization showing character of power and control in machinery.

limit the machinery to perform a sequence of prescribed operations. They very rarely correct machine adjustment in terms of output; few machines are truly self-correcting.

Feedback does not appear often because it is not necessary to much automatic production. Feedback control assumes that the machine needs to be corrected. Many machines, however, do not need correction, so feedback has no economic value.

We should not assume that automatic manufacturing always requires extremely sophisticated forms of control. Most highly automatic production systems are based upon the integration of production and handling devices, directed by control systems that direct a program of desired events.

There is no doubt that feedback control will spread and make possible superior manufacturing systems and productions. Yet, control alone does not create automaticity.

Myth No. 3 — That the only motive for automation is cost reduction through the elimination of labor. The advantages of automation are far greater in number and often in value than the average firm realizes. I would estimate that not one firm in a hundred *thoroughly* explores the favorable (and negative) aspects of automation proposals. They rarely quantify anything but labor savings, and hence overlook some splendid and valuable contributions.

Consider lead time. A parts firm cut lead time from 19 days to 2-3 days; an oil refinery from 4 days to 5 hrs; a feed mill from 2 manhours to 5 manminutes. What would this mean to the average firm in customer service, in inventory reduction, and in production planning?

Another firm justified their automation program solely on reduction of scrap. Still another, to provide working condition improvement. Automation made it possible for them to attract and hold women workers in a very tight labor market.

Engine plants have found that automation increases equipment utilization from about 60% to 80%. This is a clear gain of one-third in production capacity without corresponding investment or plant expansion.

Some of these other motives appear quite strange — product flexibility, for instance. Yet the fact is that a fertilizer plant adopted automation because it enabled immediate pushbutton mixing of any of 500 formulations.

Reduction in capital investment is also completely contrary to traditional automotive industry thinking about automation. The fact is that this was the major reason for automation in the most automatic plant I studied (an oil refinery). Here is a possibility that rarely enters management's or the engineer's calculations. Lower maintenance cost is also a surprising advantage.

The lesson is very clear: It is a mistake to think of automation as yielding a limited, fixed set of advantages and disadvantages. These vary widely and wildly depending upon a host of factors in the individual case. Management should explore carefully the full range of implications and quantify them wherever possible. Labor savings alone is a very naive and inadequate approach.

Myth No. 4 — That automation must cost more than a conventional system. The oil refinery I studied adopted automation primarily because the conventional plant would have cost $1,000/bbl of daily thruput, while the automated plant cost only $700/bbl. How? Because the automated plant was an integrated system eliminating much in-process tank storage and associated piping and pumping mechanism, as well as requiring only one control center instead of four. Thus automation cost less not because the equipment was cheaper, but because there was less of it.

The automotive industry normally faces heavy development costs because each piece of automation is a unique bit of machine design. Consider, though, that many of the process industries' advanced plants are unique assemblies of *fairly standard components*. When automatic production systems can be assembled out of relatively standard items, these engineering costs are enormously reduced. To the extent that this trend is occurring in the automotive industry, we can expect the differential between "conventional" and "automated" to shrink.

Many of the so-called higher costs of automation are actually the costs of inadequately planned and organized automation efforts. Carelessness, ignorance, and plain human frailty may be at fault, not automation.

The truth is that the cost of automation is not so much proportional to the amount of automaticity, but to the amount of novelty and uniqueness in what we are attempting.

Myth No. 5 — That automation inevitably raises maintenance costs. Many automotive and electrical equipment manufacturers will insist that this is so, and it often it. Yet the two most automatic plants I studied actually reduced their maintenance costs and difficulties by automation!

Oil refineries generally expect that the maintenance force will be 50-60% of the total refinery work force. In the automated refinery mentioned above the maintenance force is about 20.5% of the total refinery force, because there is significantly less machinery. The maintenance is not directly proportional to the amount of automatic equipment or the degree of automaticity, but to the total amount of machinery. Reduce this machinery enough and maintenance will fall off, too.

Maintenance, like capital cost, is made up of many factors. Well-proven standard equipment can be highly automatic and quite trouble-free. It is the novelty in equipment that results in trial and error, and hence costly debugging and frequent failure until perfected. Automatic machinery can be perfected until it has a very high degree of reliability.

The thing called maintenance usually is a blend of installation, debugging, routine servicing, downtime for tool replacement, etc., housekeeping, maintenance of tooling fixtures (as distinct from the production machine), and breakdowns. I have found no plant that has figures isolating each of these factors. They are all lumped together and charged to maintenance. Thus, "maintenance troubles" in automated plants often turn out to be installation and debugging costs, and not a true picture of the normal maintenance load at all. Furthermore, usually we hear of maintenance as of one moment — the worst moment — and not after the plant has learned to live with the system. Thus maintenance is grossly exaggerated as a liability of automation.

Myth No. 6 — That automation inevitably means upgrading labor skill requirements and severe re-training problem. It is one of the phobias of some elements of organized labor and some social scientists and industrialists that the average worker is unemployable in the highly automated plant. Evidence found in the 13 plants studied is mostly to the contrary.

To the extent that the employment opportunities are available, (a) operators' jobs often are easier and more quickly mastered in the automated plant and (b) the impact on the quantity and quality of maintenance skills required *may* be much less than expected. In fact, the prime management error in at least four of the plants studied was to assume higher skills were required on operating jobs than was so. Thus, unrealistic wage rates were set on certain jobs that were unfair to other workers in terms of relative skills required.

There are many exceptions, where knowledge, responsibility, education, and mental effort required of the worker increase. Nevertheless, analysis of many machines has preponderantly demonstrated that the higher levels of mechanization gradually or rapidly reduce the contribution by the operator.

Analyzing the evolution shown in Figure 1, first there is the substitution of mechanical power for manual effort, which takes some burden off the worker. Then, as increasing degrees of fixed control yielding a desired machine action are provided, the worker does less and less guidance of the tool. As measurement is added to the machine, the operator has a portion (or much) of the control decision information obtained for him. As the machine is given higher levels of automaticity, more and more of the decision making and appropriate follow-up such as the selection of the necessary production action, control of the production action and correction of performance are done by the machine. The more superbly automatic the machine, the less the operator has to do.

It must be recognized that a worker's contribution on a job embraces more than skill, and that skill itself is a rather indefinite blending of several things — manual dexterity, knowledge of the art, knowledge of the theory, and comprehension and decision-making ability based upon experience and other things.

The progressive effect of automation is first to relieve the operator of manual effort and then to relieve him of the need to apply continuous mental effort. At times the mental effort is increased because of the alertness and overall responsibility required. Yet the evolution of machinery shows that eventually safety devices and various recording and signaling systems are added to reduce or eliminate this demand.

The ultimate argument is to point out that this machine evolution leads to the very situation feared: Automaticity grows until *no* operators are required. Then, what employment opportunities exist? Only maintenance and design. The level of education required on some of these design jobs is of PhD caliber. The maintenance skills may require electronics training. Now the unskilled or semi-skilled worker is helpless. He does not even understand the language, let alone the job.

This grim ending neglects to account for several counteracting facts, namely:

1. The trend of invention is to mechanize difficult jobs. Thus, the maintenance job continually is being simplified by innovations such as the trouble-shooting control panels which reduce skill and training requirements, and the routinizing of many theoretically complex jobs, such as had actually been experienced in computer work. The design job is simplified in part, too. For instance, fantastically difficult mathematical jobs have been made relatively easy by the application of computers. And, as previously shown, the maintenance job itself is simplified by improved machinery that is less failure-prone.

2. The economics of machinery bar the introduction of *fully* automatic machines in hundreds of thousands of installations. Man is a far cheaper and more flexible control device than the ultimate feed-back mechanism, for many machines. Although productivity and automaticity increase, people still are required to monitor machine action or provide minor production assists. On inspection, particularly for visual flaws, it is hard to beat a man. Briefly, there is an enormous technological gulf between "automatic" and "fully automatic." Unless the machine really is fully automatic, people are quite necessary to its operation.

3. Industry is by no means the mass production world so often pictured. The mix of parts, products, and models required by many sales situations is absolutely astonishing, and the range of variety will not support automatic machinery to the ultimate.

There are at least three factors that may increase skill requirements: the assumption of responsibility for more of the production sequence (that is, a number of different kinds of machines); the assumption of responsibility for higher caliber functions like setup and inspection; and new kinds of preparation or setup jobs such as programming tapes for machine tool control. On the whole, however, automation generally reduces the demand for skill and knowledge *on the part of the operator* after reaching Mechanization Level 5 because the machine takes over more and more of these elements of the task.

So, automation does not necessarily make people unemployable because they lack skill and specialized education. On the contrary, many (and perhaps most) *operator* jobs can be mastered more quickly, with less job experience, special skill, and education as mechanization increases past

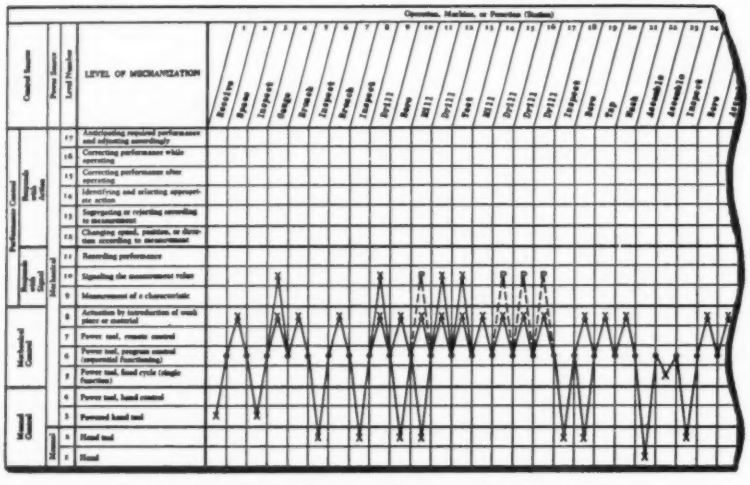


Fig. 2. Mechanization profile — cylinder block line.

Level 4 and provides increasing degrees of automaticity. The study of labor in the 13 plants confirmed this theory.

Perhaps the most valuable conclusion for today's management will result from the simplest of questions, namely: *Did the skill requirements on these automated lines create any major problems for management?* The answers:

1. Automation did not force management into drastic measures because of increases in operator skill requirements.

2. There was and is a scarcity of maintenance electricians trained in electronic work, but only something like a tenth, or perhaps a fourth, of all electricians currently need this training.

3. Hydraulic and pneumatic repairmen of adequate ability are not common, but relatively few firms ran into difficulty here.

4. Those firms that designed and built their own machinery see a distinct shortage of machine operators, engineers, and mechanics with machine building skills.

Otherwise, there is little evidence that large numbers of distinctly superior skills are required to man the automated plant.

The practical questions about causes and forces in the skill area for today's businessman are (a) "If I 'go automatic,' can I run the new plant with my present work force?" and (b) "Will I have to face a difficult retraining problem?"

Judging from the 13-plant study, the answer to the first question is "Yes" and to the second, "No"; with due allowance for minor exceptions and some, but not all, of the maintenance job. Furthermore, there is a good possibility of *lowering* skill requirements and shortening the training period on many operating jobs.

Myth No. 7 — That automation has nothing to offer labor but unemployment. It seems true that many (and probably most) automation programs aim at reducing direct labor content per unit of output. Most automation programs, however, also are sparked by the need for increased capacity. Depending upon the amount of labor reduction and the amount of capacity increase required, the net effect on labor can be anything from unemployment to far greater employment opportunities.

As an outstanding example, Ford has officially recognized and organized for automation since 1947. Today Ford employs about 40% more people than it did in 1947. This certainly is not *because* of automation, but rather in spite of it!

Another fact is that the labor impact often is distorted by the way the percentage labor savings are expressed relative to a minute part of the operation. In a foam rubber mattress plant, for instance, displacement was quoted as being 50% of the working force. On checking the figures, however, it was found that displacement amounted to 45% of the people in the pouring operation only.

This turned out to be 16% of the total force making mattresses, or only 1½% of the total force on the plant premises.

Although the net effect on employment opportunities is uncertain, there is no doubt at all that automation offers the worker distinct job advantages. For operating labor, automation means:

- Easier work.
- More interesting work through variety of job activity.
- A more satisfying job through a sense of responsibility for a larger portion of the end result.
- More pleasant job surroundings.
- Higher pay through increased productivity.
- The satisfaction and prestige of working in an outstanding plant.
- Greater job security against both the efforts of the firm's competition and the effects of old age on the individual's strength, dexterity, and endurance.
- Greater continuity of employment.
- A safer job.
- The pride of running a fine machine.
- Experience with advanced equipment that may be even more valuable as time goes on.

Of course, all these things do not apply in every situation. The point is that the worker has much to gain from automation. Why not tell him so?

Myth No. 8 — That automatic machinery alone is responsible for sensational advances in automatic manufacturing and productivity increases. Study of manufacturing evolution in any industry will show that at least five major factors are involved in technological improvements, including:

1. Spatial rearrangement of machinery to provide a more efficient sequence of activity.

2. Changes in materials to facilitate automatic production.

3. Changes in processes to facilitate mechanization.

4. Changes in product design.

5. Automatic machinery, which is the most spectacular aspect of automatic production. Often it is not a radical machine concept, but rather the mechanization of an act that was made simple (or eliminated) by changes in arrangement, process, material, or design.

To look to automatic machinery as the sole hero or villain of automatic production, productivity increases, and/or labor displacement is industrial naivete of the first order. We must not forget that the product designer who eliminates a part does something for productivity that surpasses any mechanization we might dream of. And when he so much as eliminates two of four fasteners, he decreases labor content without spending one cent on equipment!

There are other myths and fallacies of automation that should be exploded for the good of our economy and society, and to help industrialists develop the implications of their mechanization programs in an atmosphere of understanding. They spring in part from reality. It is a grave mistake to assume or insist that there is no truth at all in them. These negative aspects of automatic production do sometimes happen — but they happen because of the mix of factors present in the particular situation, not because they are immutable laws of mechanization and inevitable drawbacks of every automation program.

It behooves the industrialist to analyze those factors. Then he can make surer judgments as to the end results of automation in his particular case. end

Rules of the Road to

MULTI-DIAMETER HOLE ENGINEERING

by Frank Gable
Chief Engineer
WESSON COMPANY
Detroit, Michigan

PART II—Boring Tool Trouble Analysis

FROM TIME TO TIME, the best designed boring tool ends up on the machine causing one headache after another. The reasons for problems in boring cutter application or performance may be as many as they are varied. However, to guide the Trouble Shooter and anyone concerned with maintaining tool efficiency, some "Rules of the Road" can be set down to help in pinpointing specific problems and their causes and their solutions.

By nature, a tool trouble shooter is a skilled craftsman and scientist. In trouble shooting, one thing is required above all else — the analytical-scientific approach to the COMPLETE analysis of ALL machine and tool factors.

Experience has taught that to conclude the problems have been completely solved without analyzing ALL the factors frequently results in wreckage of the setup and costly repairs.

A great many common problems in boring cutter application may be the result of a relatively obscure cause. For this reason, it is essential to carry analysis through to completion by investigating ALL probable causes. If this is done, the solution to any boring tool application problem will be evident.

PROBLEM:
BLADE BREAKAGE — EDGE CHIPPING

Causes:

1. Excessive feed
2. Excessive speed
3. Excessive clearance
4. Improper grind
5. Vibration
6. Dull tools

Remedy:

EXCESSIVE FEED: In identifying this as the cause of blade breakage, look for the following:

a. Cratering or washout on cutting edges on the face of the blade
b. Ruptured and deformed chips
c. Scars and tears in the machined surface

Fig. 1. Shows a close-up of the appearance of an actual blade edge with chipping and edge wear.

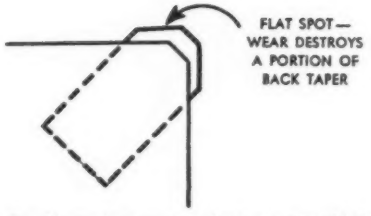


Fig. 2. Normal wear on a boring cutter blade results in the destruction of a portion of the back taper resulting in a flat spot.

d. Build-up on the blade edge
e. Thumping, build-up, stalling and inconsistent feeding due to cutting pressure variations resulting in varied "feed line" patterns on the workpiece. Note also that the varied feed lines are common to excessive feed and when rough finishes are a problem, this clue will confirm feed as the cause rather than incorrect lead angle.

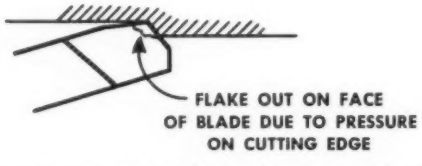


Fig. 3. Insufficient blade clearance results in "flaking" of the carbide on the blade face caused by pressures on the cutting edge.

Adjust the feed and cutting speed to balance cratering and edge wear. The proper combination of feed and speed is achieved at the point where quality, finish, tool life and production rate are dependably best. Strive for a finish having clean, consistent feed lines and a smooth, dull-gray finish.

EXCESSIVE SPEED: The following conditions will pinpoint excessive speed as the cause of breakage:

a. Blade edges will be discolored and have saw-tooth edges
b. Chips will come out balled and welded
c. Chips weld to the face of the blade
d. Excessive heat is generated. In extreme cases, the cutter will seize in the work.

Check the speed range for given material and consider machine and fixture condition, amount of stock removal (depth of cut), and work within 75% of horsepower on feed and speed combinations.

EXCESSIVE CLEARANCE: When this causes breakage or chipping, it is easily identified:

a. Saw-tooth edges appear after only limited cutter usage
b. Chatter
c. Poor finish

Since the problem is caused by improper grinding (removing excessive stock behind the cutting edge), correct clearances suitable for the material being machined and other machine factors (rigidity, etc.) should be firmly established. Specify correct clearances on the cutter blue prints and insure that the cutter is properly inspected before leaving cutter grind.

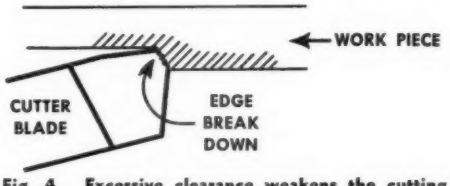


Fig. 4. Excessive clearance weakens the cutting edge resulting in accelerated wear and breakage. After only limited use, a "saw-tooth" edge results.

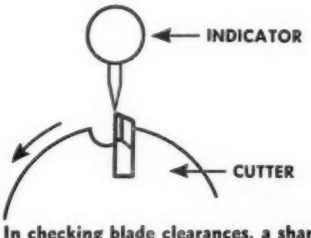


Fig. 5. In checking blade clearances, a sharp point indicator should be employed. Clearance drop should be checked by rotating the cutter between centers.

VIBRATION: As the cause of breakage or chipping, this is the easiest cause to pinpoint:

a. A screeching sound
b. Poor finish
c. Vibration felt by touching the workpiece holding device or the cutter spindle head

The corrective steps to be applied in the case of vibration are fully described under the heading of VIBRATION problems. However, the problem as it relates to breakage calls for a check on all fixtures, spindle and mounting methods, alignment, gearing, excessive clearances, and eccentric stock.

DULL EDGES: Where dull edges are the probable cause of breakage, confirm by checking the following conditions:

a. Balled and welded chips
b. Tearing and general roughness
c. Undersized holes
d. Finish goes from a smooth, dull-gray to a high glaze

Regardless of the specific cause, dull edges result in blade breakage when the sizing point wears along the O.D. of the blade eliminating a portion of the back taper and continued usage results in breakage.

Determine the number of parts that can be run to a normal dull edge (.010-.015) wear land, or

a point where quality in the work is doubtful of acceptance. Set tool-change point within 80% of this total thus providing a resharpening time and elimination of the breakage.

IMPROPER GRINDING: As a source of trouble, improper grinding is easily identified:

a. Blade run-out on the lead (chamfer) angle
b. Rough grinding finish causes pick-up or blade edge build-up
c. Insufficient or excessive clearances will either bind or result in chatter and poor finish

The result of blade run-out on the lead angle is apparent; the chip load is taken by only one or two blades instead of all blades evenly. This will result in inconsistent finish, out-of-round hole and failure of the cutter to duplicate size.

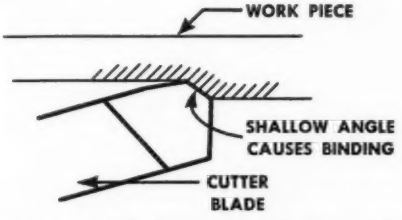


Fig. 6A. If the lead angle is too shallow, as illustrated, it results in binding and excessive edge wear.

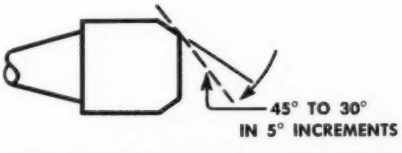


Fig. 6B. To eliminate binding, excessive wear or tendency of the cutter to follow cored hole rather than cutting its own path resulting from a shallow lead angle, increase the lead in increments of 5° to between 30° and 45°.

Check run-out over the blades with an indicator while the cutter is still mounted on the machine. Dismount the cutter and check shank run-out against blade O.D. run-out. This will determine if the fault lies in improper grinding.

Before the cutter leaves cutter grind, run-out should be checked with lead angle run-out held to .0005" total indicator reading. Use sharp point indicator and check clearance drop by rotating the cutter between centers.

PROBLEM: BURNING OF THE CUTTING EDGE

Causes:

1. Excessive speed-feed
2. Hard work material
3. Inadequate, improper coolant
4. Insufficient clearance

Remedy:

EXCESSIVE SPEED-FEED: Check for the following conditions resulting from excessive speeds and feeds:

a. Cutter will throw sparks
b. Chips deformed and frequently "cinder-like" in consistency
c. Discoloration of the blade and chips will usually be welded to the edge or "gummed" into chip gullets

Adjust the feed and speed combination downward. Check the speed range indicated for the material being machined.

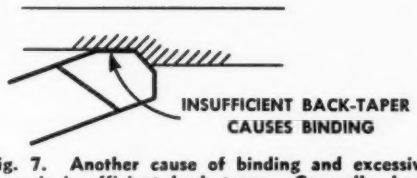


Fig. 7. Another cause of binding and excessive wear is insufficient back taper. Generally, back taper of from .001 to .002 per inch of blade length will solve problem. If operation is heavy roughing, increase the back taper.

HARD WORK MATERIAL: Check the following to ascertain if breakage is resulting from this cause:

a. Burnishing of the work surface
b. Chips change from normal to deformed shapes
c. Premature dulling of the cutter. Depending on H.P., feed and speed and amount of stock removal, the cutter will slow down and, when dull enough, will stall.

The remedy, of course, is to adjust the speed and feed combination. If the job is running dry, flood the workpiece with coolant, if possible.

IMPROPER OR INADEQUATE COOLANT: As a source of trouble, improper or inadequate coolant is encountered less than other causes listed. However, check the following conditions:

a. Straight oil coolants will cause tool burning at speeds generally employed with carbide tooling. Straight oils have low sparking points, and frictional heat induced at high cutting speeds cause the burning.
b. Improper coolants will result in blade edge build-up which prevents the blade from shearing the metal correctly, resulting in a rough finish.

If possible, always use water emulsions or emulsions that have high cooling qualities and proper lubricating qualities with carbide boring tools.

PROBLEM: CRATERING

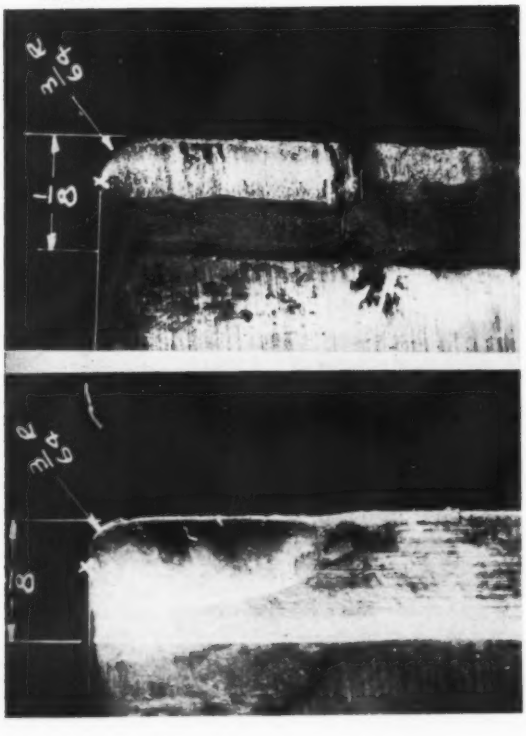
Causes:
1. Excessive feed-speed
2. Improper grade of carbide
3. Improper coolant
4. Improper rake angles

Remedy:
In solving problems of cratering, strive for the easiest solution; reduce feed, change to harder grade of carbide, or change the coolant. Radial and axial rake angles are difficult to change. If the other solutions don't work, choose between the lesser of two evils — such as, between reduced production because of frequent tool changes or reduced production from reduced feed rates.

Cratering resulting from the application of the wrong grade of carbide can be distinguished from cratering caused by excessive feeds since "soft grade" craters are smoother — like a grind — than those caused by heavy feeds.

In changing to a harder grade of carbide, get a chemical analysis of the material being machined. The analysis chart will show the composition of elements in percentages. If the abrasive elements, such as silicon, chrome, nickel, titanium, etc., are high in content, it may be advisable to use a non-ferrous grade of carbide even though the work material might be classified under ferrous metals.

Fig. 8. Shows a close-up of the appearance of crater.



PROBLEM: EXCESSIVE BLADE EDGE WEAR

Causes:
1. High machining speed
2. Hard materials or abrasive materials
3. Misalignment
4. Improper grinding
5. Excessive clearance
6. Insufficient clearance
7. Rough grinding

Remedy:
The solutions to the causes listed above have been discussed in the solutions of other problems. However, there are several other sources or trouble, including:

1. Feed too fine
2. Chamfer angle too shallow
3. Incorrect back taper

When cutting speed is correct, feed rate should govern required finish. For example: if suitable finish is produced at 100 rpm at .010 inch feed per revolution, the tool point has been subjected to 100 rpm's of friction. If the feed rate is reduced to .005 ipr, and the 100 rpm's maintained, the tool will be subjected to 200 rpm's of wear over the same distance.

When the chamfer angle is too shallow or where there is insufficient back taper, binding of the blade on the workpiece will occur. This accelerates wear.

PROBLEM: CHATTER

Causes:
1. Speed too high for feed rate
2. Incorrect lead angle
3. Loose or tight gibs in head
4. Improper chucking
5. Lack of spindle-fixture rigidity
6. Excessive clearances
7. Misalignment

Remedy:
SPEED TOO HIGH: When the speed is too high, the blades do not have time to remove stock at the proper rate per revolution — the action is "dig and ride" or "cut and skip" alternately. Strive for a balanced speed and feed combination rate by analyzing machine conditions, material, depth of cut and horsepower available.

INCORRECT LEAD (CHAMFER) ANGLE: A long lead angle means a longer cutting line or work contact. This can cause chatter, although clearance angles, in conjunction with lead angle, is always a controlling factor in chatter problems. A lead angle that is excessive in length will cause binding. Correct the lead angle working within 30° to 45°. The length of

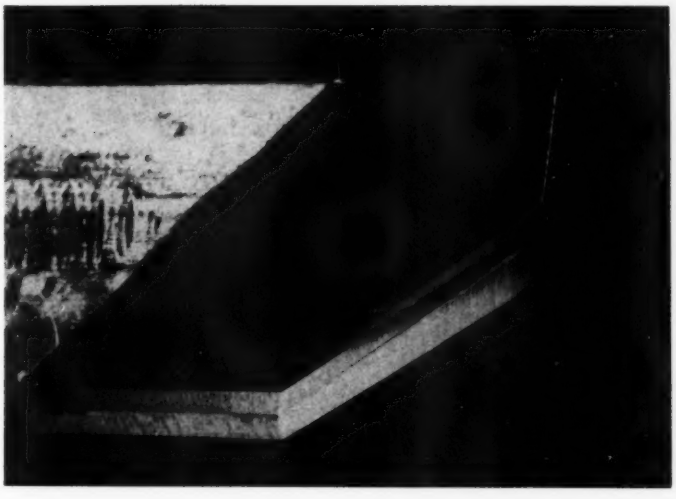


Fig. 9. Shows a close-up of normal wear land on a blade edge.

the lead angle should exceed the maximum depth of cut.

GIBS TOO LOOSE/TIGHT: Where gibs in the machine head are found to be the probable cause of chatter, simply make the necessary adjustment. The degree of adjustment necessary will depend on the condition of the machine generally. Adjusting to the point where chatter is ELIMINATED will usually solve the problem.

IMPROPER CHUCKING: Obviously, a check must be made to insure that there is proper chucking and for minimum run-out on the workpiece. As a rule of thumb, always chuck the workpiece as close as possible to the area to be machined.

LACK OF SPINDLE-FIXTURE RIGIDITY: Make spindle thrust adjustment and bolster rigidity of the fixture. If the problem persists from insufficient fixture rigidity, it may be necessary to redesign the fixture.

MISALIGNMENT: Apply corrections to angular and/or parallel misalignment.

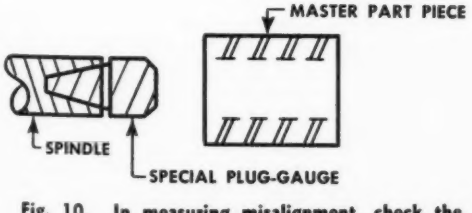


Fig. 10. In measuring misalignment, check the spindle to a master workpiece positioned in the fixture. Spindle misalignment can also be checked with an indicator attached to the spindle while revolving the spindle.

PROBLEM: UNBROKEN CHIPS

Causes:
1. Feed too light
2. Improper axial and radial rake angles

Remedy:
The problem of unbroken chips occurs primarily in the machining of ductile materials. If chips are flowing out of the bore and clearing the work and cutting edges as with a correctly ground drill, they are unlikely to cause problems. However:

FEED TOO LIGHT: When chips are causing trouble and a light feed is being used, step up the feed if the quality of finish permits. Thicker chips break more readily than thinner chips.

IMPROPER RAKE ANGLES: If improper rake angles are creating the problem, ground-in chip breakers should be experimented with to solve the problem. Changing rake angles by special grinds is limited and extremely costly and should be avoided if possible.

PROBLEM: WHIP-LASH

Causes:
1. Spindle reach too great
2. Excessive eccentric stock in the workpiece
3. Angular misalignment

Remedy:
The specific cause of the whiplash problem can be easily identified and the following corrective steps should be taken:

EXCESSIVE SPINDLE REACH: Use a spindle guide or support unless conditions permit a change of set-up to shorten the spindle reach.

ECCENTRIC STOCK: Specify closer control of casting or forging to eliminate the problem.

ANGULAR MISALIGNMENT: Check the manner in which the cutter is mounted. Check run-out with an indicator. Taper-sleeved cutters should be checked for scars, burrs and foreign matter. The female taper in the spindle should be inspected for the same faults. Small burrs and deformities can be scraped out of the spindle sleeve. Larger deformities may require reconditioning or a new sleeve. However, a careful regrinding of the tapered spindle of the boring head can usually correct the fault.

PROBLEM: CUTTER SLOW-DOWN

Causes:

1. Dull edges
2. Lack of back-taper on O.D. of cutter blades
3. Shallow lead angle
4. Excessive stock, feed or speed
5. Misalignment

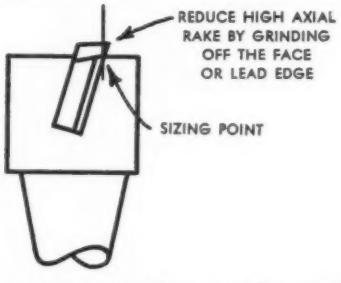


Fig. 11. Cutter slow-down may be caused from high positive axial rake angles. Reduce the axial rake by grinding off the face along the lead angle. However, do not grind beyond the lead angle as this will reduce the sizing point.

Remedy:

The primary cause of cutter slow-down is dull edges. However, dull edges or any of the above mentioned causes result in over-loading of the motor — higher horsepower consumption. Feed, depth of cut, or cubic inch of stock removal, govern H.P. consumption. Depth of cut, feeds and speeds should be set to remove stock at a rate that consumes not more than 75% of the H.P. capacity.

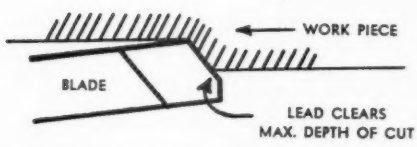


Fig. 12A. Where small lead angles create trouble, correct by lengthening the lead to exceed maximum depth of cut.

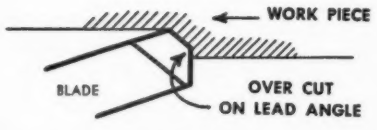


Fig. 12. When the depth of cut exceeds the lead angle, excess stock is removed on the face of the blade resulting in higher H.P. consumption, chip problems, accelerated wear, chatter and poor finish.

DULL EDGES: Check to insure that tool-change cycle is adhered to. Premature dulling indicates the existence of one or more of the conditions discussed under EDGE WEAR PROBLEMS.

LACK OF BACK TAPER: Check to insure that sufficient back taper is ground on the blade. The rule of thumb for back taper of .001 to .002 per inch of blade length should be applied, and the back taper required for the type of material being machined should be clearly specified on cutter B/P.

SHALLOW LEAD ANGLE: Frequently, the depth of cut will exceed the lead angle if designed too small initially. This results in the blade removing stock on the blade face as well as the cutting edge. The additional load may result in cutter slow-down. Increase the size of the lead angle to exceed maximum depth of cut.

EXCESSIVE STOCK, FEED OR SPEED: Reduce the feed rate.

MISALIGNMENT: Check for cutter or spindle misalignment and make corrections. end

SPECIAL FLUXES FOR BRAZING CARBIDES

Under normal conditions, no special materials or techniques are necessary to produce satisfactory joints when brazing carbides containing titanium, tantalum and tungsten combinations.

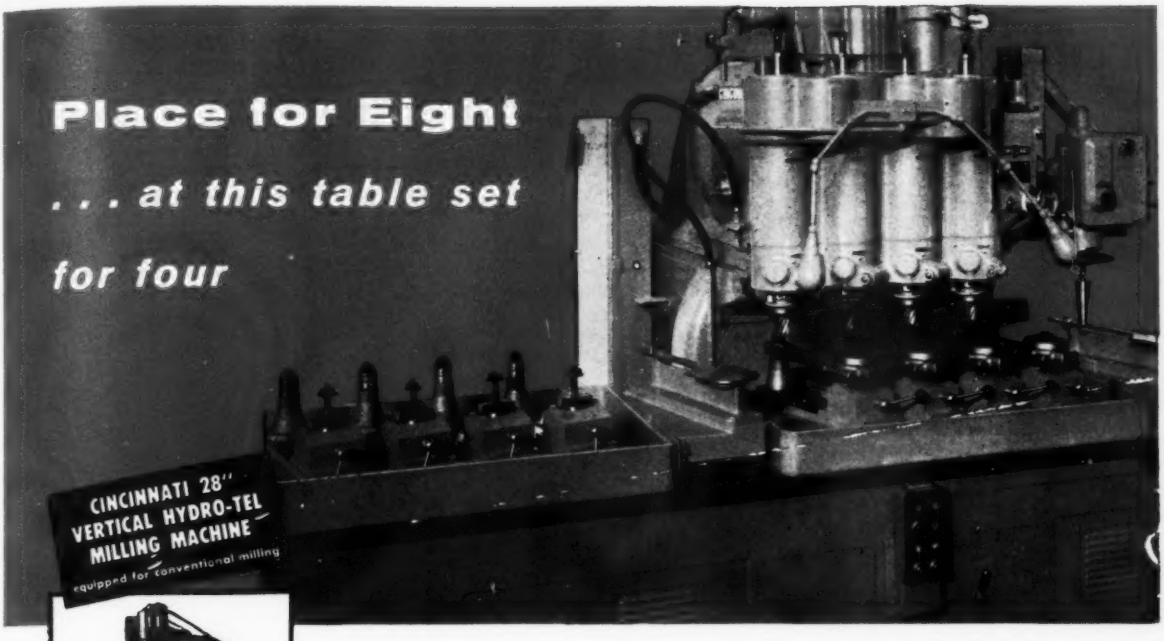
If, however, unusual conditions are encountered — such as long heating period, high temperatures or rebrazing, it is necessary to use a special flux, according to Fred J. Kelly, development engineer for General Electric's Metallurgical Products Department in Detroit.

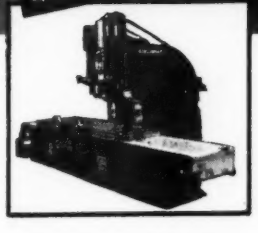
The special flux, he says, should be one that will dissolve the oxides of titanium and tantalum generally formed under these conditions, a job that cannot be done with standard fluxes commonly used for silver brazing.

According to Kelly, two special proprietary fluxes to date have been found satisfactory when brazing under such unusual conditions. Both contain either silicon or boron additives, which are strong oxide reducers — as well as the customary chemicals included in good fluxes.

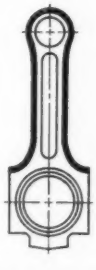
It would be entirely satisfactory to use these brazing materials for all carbide tool brazing operations but, he cautions, their shelf life should be watched, since it is not as good as the life of standard fluxes.

Consistently good brazes can be made with standard fluxes with induction heat, torch and furnace brazing — even under conditions which are not ideal. But if oxides are allowed to form, it is not possible to produce satisfactory joints unless the special fluxes are employed.





It's an established principle for methods engineers in the "know"... while one or a group of parts is feeding past the cutters, a second fixture mounted on the machine is reloaded for its turn at the feeding station. In many cases handling time chargeable to cost is practically nil. ¶Advantages of this principle are very much worth while for the milling operation illustrated here. A CINCINNATI® 28" Vertical Hydro-Tel, with 96" table traverse, is equipped with duplicate fixtures and a four-spindle head to automatically profile mill four connecting rods at one time. Surfaces milled are indicated in the drawing. This Hydro-Tel is equipped for 360° automatic profile milling, one of the seven ways in which Hydro-Tel machines are built for various types of work. The complete list includes:



Drawing of part. Surface outlined is automatically profile milled in one continuous cut.

1) **Conventional milling, low series spindle speeds**
2) **Conventional milling, high series spindle speeds**
3) **Die sinking**
4) **360 degree automatic profiling, non-selective**
5) **Die sinking and 360 degree automatic profiling, non-selective**
6) **360 degree automatic profiling, selective**
7) **Die sinking and 360 degree automatic profiling, selective**

28" Vertical Hydro-Tels have plenty of range for large work; 60", 96" or 120" table traverse; single spindle head or 2, 3 or 4 spindles. May we give you more information? Write for catalog M-1773-2. For brief specifications look in Sweet's Machine Tool File.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES
HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

CIRCLE INFORM-A-GRAM KEY NO. 105

GROWING PAINS

Construction has begun in Knox, Ind., on a 35,000-sq-ft valve parts plant for **Valve Products, Inc.**, subsidary of **Rockwell Manufacturing Company.** It will produce parts for the Rockwell-Edward high-pressure, high-temperature valves and Rockwell-Nordstrom lubricated plug valves. The new plant will be completed the first half of this year.

◆

As a result of a constantly growing industry demand for bigger grinding machines, **Mattison Machine Works** is adding 16,800 sq ft to its assembly area. This addition doubles the assembly area for large machines and represents a 50% increase in total assembly area. The firm is a leading builder of surface grinders to handle parts of varying sizes.

◆

Standard Pressed Steel Company is building a $1.4-million addition to the plant of the Hallowell Steel Shop Equipment Division. Housed in the structure, which will be in operation by the middle of this year, will be $500,000 worth of new machinery. The construction now in progress will add 80,000 sq ft of factory space to the pressed steel shops at Jenkintown, Pa. Also being built is a highly functional, multi-product manufacturing facility. Located at Santa Ana, Calif., the plant is capable of switching efficiently from one product to another. When completed early next year, the 280,000-sq-ft factory will employ approximately 500 people. It is designed for expansion to three times its initial size.

◆

Temco Aircraft Corporation is constructing a 100,000-sq-ft engineering research and development center at its Garland, Tex., plant. A large portion of the company's engineering department will be transferred there in July. Also planned for the plant is a 100,000-sq-ft office building.

◆

The Niagara Cutter Division of **Bollier-Damerell, Inc.** is adding 6,000 sq ft to its facilities by taking over another building. Additional space and equipment is needed for the production of Niagara specialized cutting and boring tools.

A multi-million dollar expansion program bringing a 40% increase to automotive frame production at **Dana Corporation's** Parish Pressed Steel Division in Reading, Pa., has been completed. Involved was the construction of two additional bays, one 560 ft. long by 90 ft wide, and the other 820 ft by 90 ft.

◆

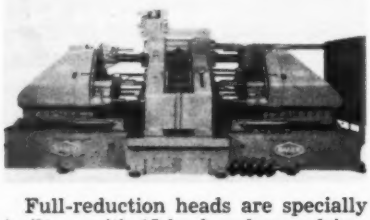
Consolidated Electrodynamics Corporation is building a 130,000-sq-ft two-story office and plant building near Monrovia, Calif. A second structure, similar in size, will be added within two to four years.

◆

Arrow Tool Company, Inc. has announced the addition of 5,000 sq ft of floor space, doubling the size of its Wethersfield, Conn., plant. Arrow Tool specializes in instrument prototype and production work and also designs and builds jigs, fixtures, and carbide tools. The company has also formed a production subsidiary, Mech-tron Instrument Corporation, with David T. Dewhurst as president. The new subsidiary will manufacture precision electro-mechanical components and assemblies for the electronics and business machine industries.

STANDARD UNITS AND TOOLING CONVERTED TO AUTOMATIC CYCLING

Performing core drilling and reaming on a completely automatic cycle has been made possible by a new 5-station trunnion type machine. It was designed to complete these operations on forged steel knuckles attaining a rate of 52 pcs/hr at 100% efficiency.



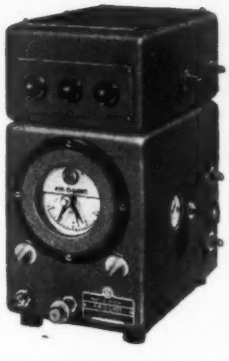
Full-reduction heads are specially built — with 15-hp bevel gear drive, mounted on Baker Brothers Basic model 1830 standard slides — and utilize standard tooling. Baker Basics are flexible automation units that can be used in combination as a transfer machine, or used separately.

Drive units travel on flame-hardened bar slides. Twin-pull cylinders for feed are located on the outside of the slide, easily accessible for service. Hydraulic power is supplied by a separate Baker Porta-Pak. This unit too is accessible for maintenance and easily replaceable. Lubrication is centralized and automatic.

BUILD A GAGE INSTALLATION TO SUIT YOUR NEEDS . . .

with these packaged, on-the-shelf P&W Air-O-Limit Light Signal Units. Can be used to signal operator or to provide feed-back impulse for fully automatic process control.

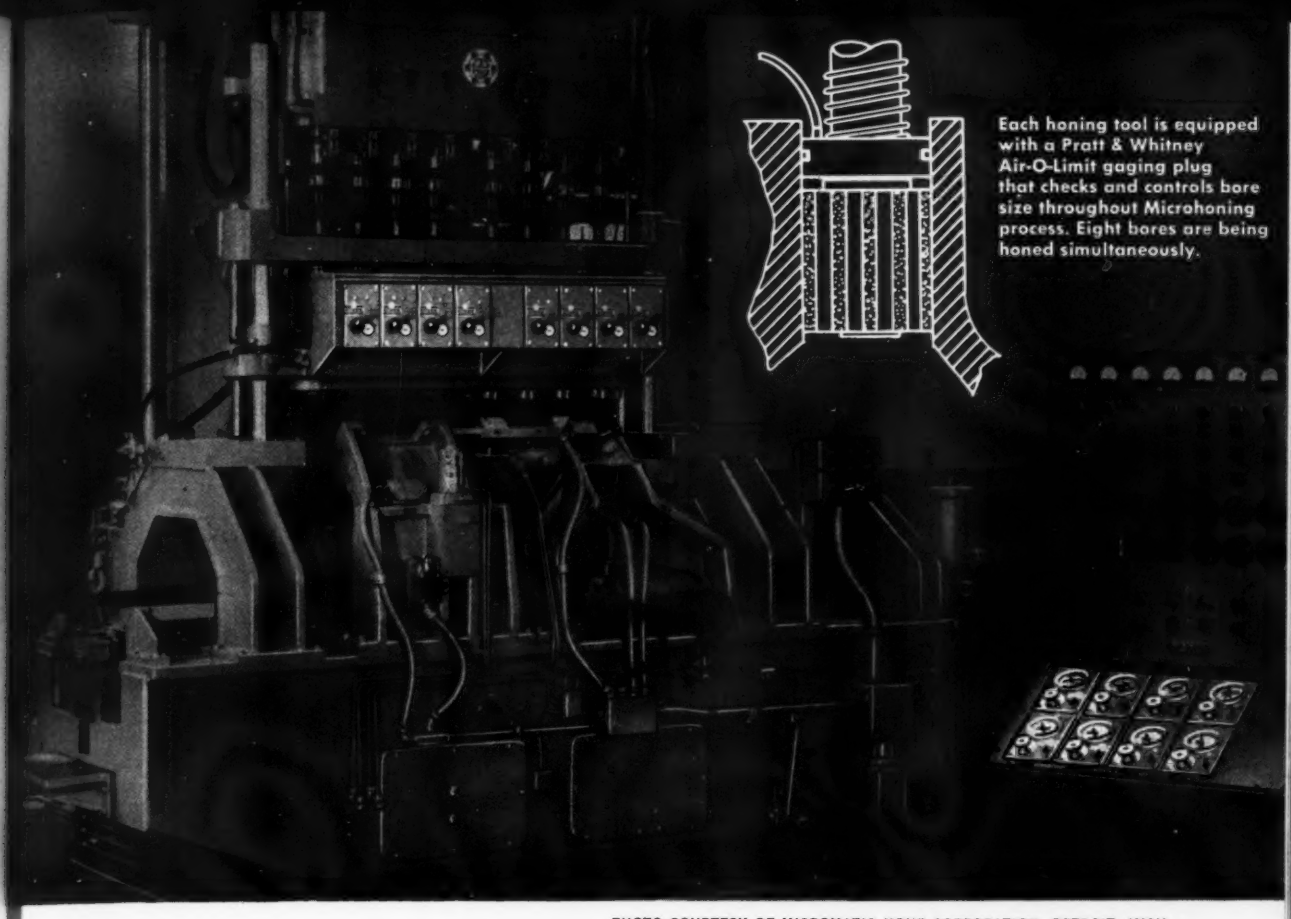
BASIC 2-LIMIT UNIT . . . indicates high and low tolerances. Suitable for sorting and other "yes-or-no" control applications.



3-LIMIT UNIT . . . especially suited for grinding and similar operations. Indicates or automatically controls such conditions as: "Fast Feed," "Slow Feed," and "Spark-Out."

4-LIMIT UNIT . . . similar to 3-Limit Unit, but provides greater control scope. Indicates or controls such conditions as: "Approach High Limit," "High Limit," "Approach Low Limit" and "Low Limit."

CIRCLE INFORM-A-GRAM KEY NO. 107



Each honing tool is equipped with a Pratt & Whitney Air-O-Limit gaging plug that checks and controls bore size throughout Microhoning process. Eight bores are being honed simultaneously.

PHOTO COURTESY OF MICROMATIC HONE CORPORATION, DETROIT, MICH.

Make Your Investment in Precision Pay Off in PRODUCTION

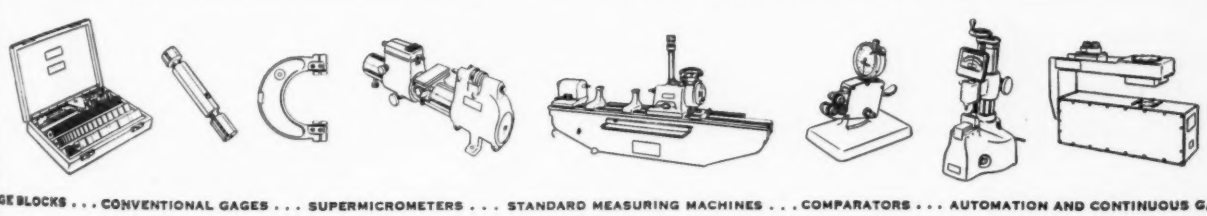
. . . WITH PRATT & WHITNEY "PACKAGED" AUTOMATION GAGE UNITS

Applied to your precision production machines, "P&W Automation Gaging" will make it possible for you to increase production, reduce scrap losses and put to work more effectively the high precision built into your equipment. And in addition, the use of Pratt & Whitney standard, on-the-shelf Packaged Gage Units will provide an installation *custom-tailored* to your exact needs *WITHOUT* the expense and delays involved in engineering and constructing special controls.

In this example – a Micromatic Hydrohoner – automotive cylinder blocks are gaged *during* the Microhoning process. When final size is reached, the machine is automatically shut off and the Microhoning tools are retracted. A change to a different bore size can be made, without stopping the machine, by a simple adjustment on a calibrated gage control dial. Visual indication is given of the accuracy of the new adjustment. Cylinder blocks are produced at a rate of 120 per hour. Reject and scrap losses are virtually eliminated.

Make the most of *your* investment . . . make it a point to call in a P&W Field Engineer to analyze your production requirements and recommend the right P&W Automation Gaging installation to help you increase output, improve accuracy and reduce reject losses.

Pratt & Whitney Company, Incorporated,
15 Charter Oak Boulevard, West Hartford, Connecticut.



GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS . . . STANDARD MEASURING MACHINES . . . COMPARATORS . . . AUTOMATION AND CONTINUOUS GAGES

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 107

Reid-O-Matic

all electric 824 PRECISION SURFACE GRINDER

Fully Automatic Finger-Tip Controls

Reid-O-Matic Model 824 . . . the most versatile surface grinder in today's metalworking field, is completely electric . . . fully automatic. A control panel, at finger-tip level provides complete power control of all grinder adjustments.

Reid-O-Matic operators can "set-up" faster . . . change settings quicker . . . produce close tolerance grinding in the toolroom without unnecessary labor. For your surface grinding specialists, the new Reid-O-Matic is a "Production Giant."

SPECIFICATIONS

Capacity: 8" wide, 24" long, 21" high from table to center of spindle. Standard wheel 12" x 3" x ¾" included.
Table Speed: Infinitely variable from 0 to 90 F. P. M.
Cross Feed: Infinitely variable from .001 to .250.
Floor Space: 93" x 51½" x 71¾" high.
Weight: 4,000 lbs., Net.

For Production and Toolroom Grinding . . .

REID BROTHERS COMPANY, Inc.

133 Elliott Street, Beverly, Massachusetts

Write for Bulletin 824

MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

CIRCLE INFORM-A-GRAM KEY NO. 108

MORE HOLDING POWER

than any other PERMANENT MAGNET CHUCK!

Make your own tests! Just fill out the coupon below and we'll be glad to demonstrate the new Brown & Sharpe permanent magnet chucks in your plant. You'll have a chance to compare the increased holding power... see actual samples of work done on grinding and milling machines using this strongest permanent magnet chuck on the market!

NEW BROWN & SHARPE Rectangular Model Permanent Magnet Chucks

Greater Holding Power — Greater holding power than any other permanent magnet chuck... greater holding power for most jobs, in fact, than electromagnetic chucks with standard pole spacing.

Lower Height — Provides additional vertical clearance.

Larger Magnetic Area — Lets you put more work on the chuck... holds it tightly over the full magnetic surface.

New L-Type Back Rail — Makes it easier to true work-locating edge in position... eliminates the need for spacing members between rail and work.

Lighter Weight — Lightened 25% for easy handling.

Longer Lever — Provides leverage for easy operation.

Two Sizes — 5" x 10" x 2" and 6" x 18" x 2½".

The new Rectangular Model Chucks also have all the advantages of other Brown & Sharpe Permanent Magnet Chucks. They require no electrical connections, wires, switches, or auxiliary generators. There's no heating — no operating cost. A simple turn of the lever holds or releases the work.

SEND COUPON FOR LITERATURE OR A DRAMATIC DEMONSTRATION
BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S

Brown & Sharpe

MILLING, GRINDING AND SCREW MACHINES, CUTTERS,
MACHINE TOOL ACCESSORIES, PRECISION TOOLS, PUMPS

Brown & Sharpe Mfg. Co.
Providence, R. I.

Gentlemen:
Please send me more information about your new Permanent Magnet Chuck ☐

I would like to see a free demonstration ☐

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

THE ENGINEER IN PATENT SUITS

by Robert L. Spencer
Patent Section
Central Office Staff
GENERAL MOTORS CORPORATION
Detroit, Michigan

THE DEFENSE TEAM in suits for patent infringement usually includes a trial attorney who is in charge of the case, an engineer who is the technical expert, and the corporation or house patent attorney, if there is one. In addition, there may be a so-called "patent expert."

Preparing for a trial is essentially an investigative and educational procedure wherein the attorneys, engineers, and experts become familiar with the patent in suit and the accused structure and develop and become familiar with the defense material. The objective is to develop the best defenses and present them simply and directly so that a technically untrained person can readily understand and follow the argument of the trial attorney without undue effort. To achieve this result may require, in a complicated case, close screening of possible defenses with elimination of some for the sake of simplicity and understanding. This screening process necessitates careful analysis and study by both the engineers and attorneys in order that the attorneys may have a correct understanding of the technical aspects of the operation and function of the patented structure, the accused structure, and the defense material. At the same time, the engineers involved receive a clear picture of what the issues are and how these issues are to be met. By the time the defenses are determined, the engineers are thoroughly familiar with the patented structure, the accused structure, the issues, how the defense material applies to the issues, and why it is being used.

Engineering Facts Must Be Collected, Analyzed

By filing a suit for patent infringement, the patentee is saying, in effect, "You have used my invention—pay me." One of the most effective ways to counteract this charge is to show the Court that the accused device, or others like it, or the patented device was developed by the defendant before the plaintiff filed his application for his patent. Such a defense obviates any claim of "getting something for nothing" from the patentee. In addition, where it can be shown that the accused device was developed independently of the patentee, the distinctions between the patented and accused devices may be pointed out more effectually, and the defense is more readily accepted. To establish such a defense requires a thorough investigation of prior developments by the defendant, including not only the accused structure itself but any additional developments of like nature which may or may not prove to be helpful. Obviously this investigative phase is lengthy and difficult and requires expert technical assistance which can only be rendered by the engineers acquainted with the subject matter. In the course of the investigation, thousands of documents, such as drawings, purchase orders, and test reports, may have to be examined. It is only through close cooperation with the engineers involved that a clear picture of various pertinent developments can be obtained.

When the defense material has been collected, analyzed, and what is to be used has been determined, the problem is to present the defenses in such a clear and concise manner that they can be readily understood in a minimum of court time. This is usually accomplished through the use of large charts illustrating the patent in suit, the accused device, and the defense material. Here again the technical assistance of the engineer is required in order to insure accuracy of representation so that the charts may not be attacked for failure to truly illustrate the device they represent.

Most patent infringement suits are tried by a Judge without a jury, but in a few there is a jury in addition to the Judge. In either case, it must be remembered that neither the Judge nor jury will be familiar with the subject matter, and the chances are that neither will be technically trained. Therefore, the manner in which the defenses are presented may spell the difference between success and failure, and consequently, it is important not only that they be presented in a technically accurate fashion but also that they be presented as simply and clearly as possible. The charts are the tools by which the trial attorney is able to present his case in a minimum of time and with clarity. To prepare them so that they tell their story simply, clearly, and accurately presents a real challenge to the engineers, as well as the lawyers.

Charts Aid Technical Understanding by the Court

Throughout the course of the trial the charts are before the Judge and the jury, and, when well done, they may be very effective. Charts do not constitute evidence, and evidence, of course, must be presented. However, the evidence as illustrated by the charts receives a great deal of attention and may create important impressions. This was well illustrated in a recent suit wherein the plaintiff presented his case by the use of charts which were obscure and hard to follow. At the conclusion of plaintiff's case, neither the Judge nor the jury understood the patented device, the accused structure, or the issues involved. The jury was clearly bored and mentally fatigued. Fortunately, the defendant's charts had been colored and otherwise prepared so that the various parts of the patented device and accused structure could be seen and understood easily. The jury learned about the case from the defendant rather than the plaintiff. After 3 weeks of trial time, the jury required 20 minutes to return a verdict for the defendant. It was largely a result of the careful and extensive preparation and assistance on the part of the engineers connected with the defense of this suit that the defendant's case was presented clearly, understood, and accepted by the jury.

In summary, the role of the engineer in a suit for patent infringement is an important one. It includes assisting the attorney to find the evidence, studying and analyzing the patent in suit and its relation to the accused structure, giving technical advice to the attorney throughout the development of the defenses, rendering technical assistance in preparation of charts and other exhibits used in the court room, and testifying at the trial.

Copyright by GENERAL MOTORS ENGINEERING JOURNAL which is available regularly only to engineering educators and technical libraries.

Carbide Tooling

HOT HEADING TITANIUM BOLTS WITH CARBIDE DIES

A production increase of roughly 16 times, and bolts of better physical properties finished consistently to final size — that's what happened when Voi-Shan Mfg. Co., switched to cemented carbide dies in hot heading titanium aircraft bolts.

According to the company, which processes fasteners for both aircraft frames and jet engines, application of the carbide dies boosted production from 150 to better than 2500 bolts/hr by providing greater resistance to wear, and eliminating galling.

Although the company uses cold heading in upsetting its steel alloy bolts, all of its titanium and some of its stainless steel bolts in larger sizes are hot forged in order to obtain the maximum in physicals.

In hot heading, Voi-Shan uses titanium of the RC130 series. The material, in the form of cut-off blanks, is placed in the coil of an induction heater and heated to around 1500°F for about 3 sec. The die itself is not normally preheated.

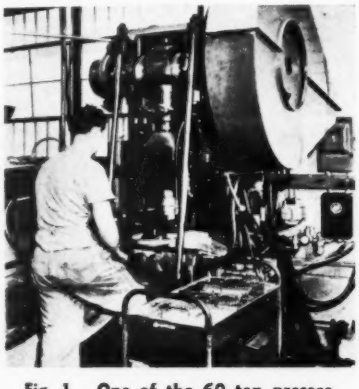


Fig. 1. One of the 60-ton presses employed by Voi-Shan Mfg. Co., to hot forge titanium aircraft bolts at the rate of 2500/hr. View shows Carboloy grade 190 carbide die in open-head machine, and induction heater near operator's left shoulder.

Temperature of the induction heater, however, is controlled carefully since excessive temperature results in grain growth and other detrimental effects. Insufficient temperature produces incipient or open internal or surface cracking.

Following heating, the blanks are inserted, one at a time, into the die of an open-head machine. The operation is almost semi-automatic since the operator trips the press to form the desired configuration and eject the bolt, while he inserts another blank in the induction heater. Both 60 and 85-ton mechanical, and 60-ton hydraulic presses are used.

Before shifting to carbide dies, the company experienced considerable difficulty with steel dies. One reason was the heat involved in the hot heading — which caused the steel dies to break down quickly, particularly on the radius at the end of the inside diameter. Another reason was a galling problem due to the affinity of titanium to steel.

Fig. 2. Various configurations produced in titanium bolts through hot heading operations. Voi-Shan upset them to final size, eliminating subsequent operation such as machining.

Today, the company's special precision-built Carboloy grade 190 cemented carbide dies provide as many as 50,000 of the larger size bolts before any signs of wear show up. Previous dies wore after upsetting only 3000 bolts. The carbide dies perform even better on smaller diameter bolts, producing as many as 100,000 as against 5000 previously. In a 100,000 run, the carbide dies are removed about 10 times for repolishing.

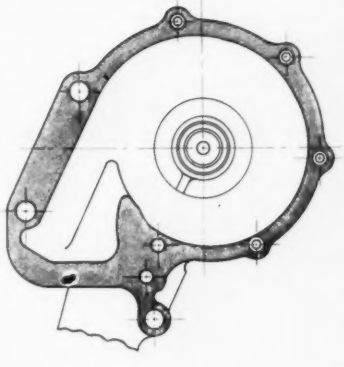
FACING TOOL COSTS REDUCED BY CHANGE TO THROW-AWAYS

Tool cost in facing flanges on small cast iron automotive water pump housings has been reduced from $4.50 to 17¢/100 at Warner Machine Products Inc., by converting tooling from brazed tip carbide to "throw-away" type insert tools with eight indexable cutting edges. Severe interruption of the cut makes this a rugged operation for any tool.

The elimination of at least 96% of the original costs is attributed largely to the elimination of tool grinding. These computed savings do not include additional savings that have resulted from elimination of set-up time for size adjustments when changing brazed tip tools.

The difference in costs is indicated by the fact that the brazed tools formerly used gave only 30 pcs/grind and 360 pcs/tool. With a tool cost of $2.50 plus $13.75 for 11 regrinds or a total of $16.25, the cost per hundred pieces came to $4.50.

Kendex inserts, obtained from Kennametal Inc., enabled the facing of an average of 142 pcs/cutting edge of a square "turnover" insert, or a total of 1136 pcs/insert. These inserts cost $1.02 each and the holder (Style KSFR-16) $9.90. Assuming a very conservative holder life, equivalent to 10 inserts, holder cost per insert would be 99¢. Tool cost is thus $2.01 for 1136 pcs or 17¢/100 pcs.



Kendex inserts are changed or indexed to a new edge in seconds and require no adjustment of machine or tool holder to maintain required gage limits. The additional savings from reduced downtime are significant also but were not computed.

The flanges are faced on a Fastermatic machine of 10 hp at 480 sfpm (231 rpm), 0.010" feed, and 3/32" depth of cut. Maximum cutting diameter is about 8".

CARBIDE USE SLATED FOR A 7-9% INCREASE

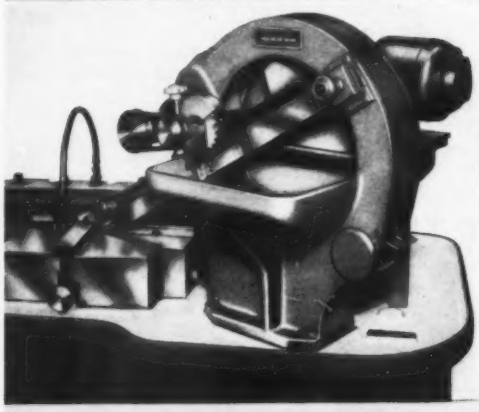
American industry will consume between 7-9% more cemented carbide metals in 1957, predicts K. R. Beardslee, general manager of General Electric's Metallurgical Products Department. His statement is based on a recent survey which, in part, indicated that consumption of cemented carbides has been increasing since 1950 by 5-8% per year.

In view of the anticipated step-up in defense spending and increased plant activity resulting from industry expansions this year, Mr. Beardslee estimates that the increase in this year's output will be closer to the 9% figure. Carbide sales for his plant alone, he believes, should be about 12% higher.

SCREWS or NAILS THREADED

with Hartford Special Automatic Thread Rollers

- **Diameters from .086 to .3125"**
- **Thread lengths from ⅛ to 2½"**
- **Large capacity hopper reduces refill time**
- **Positive positioning and feeding of blanks**
- **Variable bucket speeds**
- **Roll Class 3 Thread Fits**
- **Wired to J.I.C. Standards**



SPECIFICATIONS
MODEL A-190-R

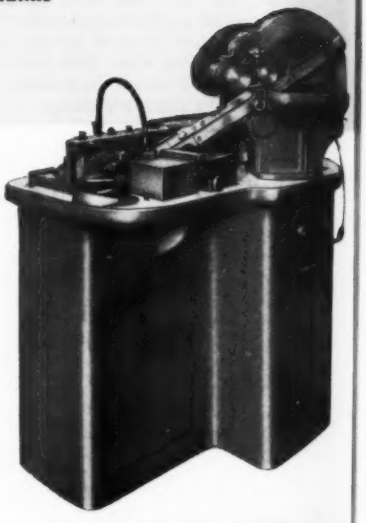
Screw Diameter Capacity: Machine Screw Sizes from #2 (.086) to #10 (.190)

Thread Length Capacity: ⅛" to 1½" with standard depth dies; 2" with special depth dies

Production Rate: 230 to 250 pieces per minute

Machine Dimensions: Length, 42"; Width, 26"; Height to table, 33"; Height overall, 52"

Floor Space Required: 4' x 5' approximately



SPECIFICATIONS
MODEL A-312-H

Screw Diameter Capacity: Machine Screw Size #6 (.138) to 5/16"

Thread Length Capacity: ⅛" to 2" with standard depth dies; 2½" with special depth dies

Production Rate: 80, 100, 120 or 140 pieces per minute dependent on screw size

Machine Dimensions: Length, 62"; Width, 39½"; Table Height, 36"; Overall Height, 63½"; Hopper Loading Height, 53"

Floor Space Required: 4'x6', approximately

Hartford's line of automatic Thread Rollers can accommodate all types of machine screws, sheet metal screws, drive screws, wood screws, nails and screwnails. They will also knurl, burnish or groove, and can handle specials as well.

These high production machines are equipped with a filtered lubrication system. They are vibration-free even at top speed. They are ruggedly designed, and engineered to provide "table-top" working level to reduce operator fatigue.

Write for Bulletin TR-102 for complete information.

Hartford Special also makes Drilling and Tapping Machines, Machine Components, Special Machines and the world famous Super-Spacer.

HARTFORD *Special*

MACHINE TOOL ACCESSORIES DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
2923 HOMESTEAD AVENUE HARTFORD 12, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 112

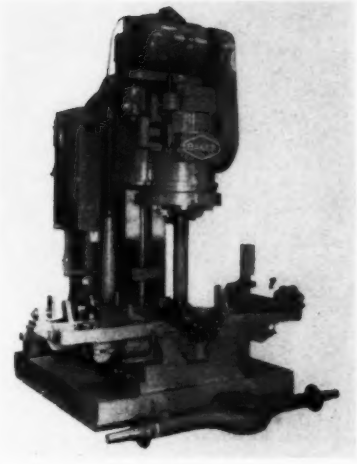
Special Machines

Basic Machine Adaptable to Special Machining

This Baker Basic machine makes an even cut entirely across the face of a rear axle housing. On loading the workpiece into the machine, a hydraulic clamping fixture grips the two ends of the housing. Next a gage, located on the fixture swings out over the center of the housing to locate the center. Then a jack raises the center of the housing to the gage. Before the facing operation begins, the gage swings out of the way.

Baker reports 34.2 housings/hr are faced at 100% efficiency. The fixture handles four different size housings. Tooling for this component is a standard Baker cross feed facing head.

The machine can be adapted to other uses such as boring, drilling and tapping, simply by changing heads. And like all Baker Basics built by Baker Brothers, Inc., Toledo, Ohio, this model can be easily retooled for changes in product or production methods. For example,



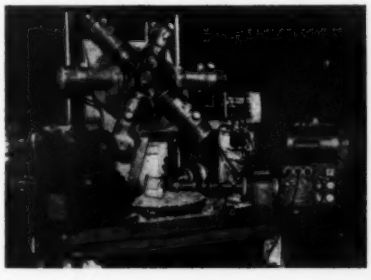
though used as a separate machine here, this Baker Basic can also be completely automated with loading and unloading devices and conveyors. Consequently, Baker Basics make automation feasible even on lower production runs as they are adaptable to change.

Special Machine Built From Standard Units

Of particular importance today is the availability of standard machine units which can be readily and economically purchased and combined with fixtures to provide special machinery setups for a multitude of production operations at higher rates and at a lower piece cost.

One manufacturer which has taken advantage of this opportunity is the Presto Line Corp., Los Angeles. They use three types of easily obtained automatic drilling units, which are combined into the unique, special machine setup shown. On it, zinc die castings are recessed, tapped and drilled in one continuous sequence handled by one man. From 260 to 300 pcs/hr flow through this setup with no scrap losses and with tolerances held well within the specifications.

The setup consists of two Dumore Series 24 automatic drill units, built by The Dumore Company, 1300 Seventeenth St., Racine, Wis., mounted



on a work table with simple nose brackets, one on the right front corner and the other located diagonally opposite. These recess both ends of the castings at the same time using Tru-Arc tool attachments. On the other two corners, also diagonally opposed, are two Dumore Series 28 "Drill-N-Tap" units which tap both ends of the castings simultaneously, after they are indexed automatically from the recessing position. A cam operated by a small electric motor controls the operation of both the No. 24 and the No. 28 units.

The operator then places the workpiece on the fixture above, consisting of six Dumore Series 20 automatic drill heads which drill six 3/32" holes in each piece simultaneously.

High Speed Boring Two In-Line Holes Simultaneously

A two station double end precision boring machine arranged with way units has been developed for use in the automotive industry.

Designed by the Olofsson Corporation, 2739 Lyons Ave., Lansing, Michigan, for high speed production, the machine finish bores two holes in-line simultaneously in cast iron differential cases. Rate of production at 100% efficiency is 250 cases/hr. Holes are bored straight and round within 0.0005".

The machine is designed with an elevator device that provides a fast and easy method for manual loading and unloading. The entire operating cycle is pushbutton controlled. The part is loaded into the nest, the clamp-start cycle button is pressed, and both units bore simultaneously and return rapidly to unload position. When the boring units are in the clear position, the hydraulically operated finger clamps automatically release the case for unloading.

A hand cycle is provided for additional retraction of spindles to facilitate setting or removal of cutting tools. It also provides independent control of either unit.

Features of the machine include: rigidly ribbed nickel iron base and center section; J.I.C. electrical and J.I.C. hydraulic controls; hardened and ground steel ways; and an automatic lubrication system.

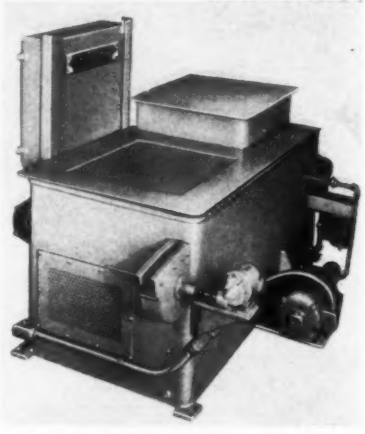
AUTOMATIC HANDLING

GEAR WASHER FITS INTO AUTOMATIC PRODUCTION LINE

An extremely compact gear washer recently developed, goes a long way toward smoothing out operation of automatic production lines. The unit which operates at room temperatures is not limited to the handling of gears or even round parts, but can be used for any production line cleaning operation where removal of either chips or loose dirt from relatively small parts is important to subsequent machining or inspection operations. Either magnetic chip separator or self-cleaning filters are available as optional equipment.

Parts may be received by gravity direct from machines on previous operations or parts may be received from a collecting floor conveyor.

Developed by the Gear-O-Mation Division, Michigan Tool Company, 17140 East 10 Mile Rd., East Detroit, this unit can handle up to 1000 parts/hr, with the parts being spray



washed and blown dry as they travel 4' through the washer. Generally it is recommended that washing solutions used be of the type that leave a rust preventive film on the part after drying.

A pump is used to spray the solution on the moving workpiece and an oversize scavenger pump is used to pull the solution out of the bottom sump and into the top tank. Use of the oversize scavenger pump assures that there will always be more than an adequate supply of solution in the top tank for the spray washing operation. After the work has been subjected to the pressure spray for removal of dirt, chips, etc., it passes a 1-hp blower for drying before exiting to the succeeding operation in the manufacturing cycle.

Floor space requirements are only 3' by 5', permitting its installation in a completely integrated line without affecting the overall floor space requirements to any appreciable extent.

HOIST CONVEYOR SYSTEM APPLIED TO AUTOMATIC PLATING

A system of automatic duty cycle hoists that combine to form a highly flexible, continuous processing system has been developed and puts the monorail electric hoist with motor driven trolley directly into the automation handling picture.

One of the new systems, built by Yale and Towne Manufacturing Co., is in operation at the Gillette Safety Razor Company. The razor manufacturer wanted a system for plating small razor parts that would be faster, more compact and more flexible than the old rack plating process and one in which manual handling and lifting was kept at an absolute minimum.

The load is cycled through the first phases of the plating process by manual control of the hoist pushbutton controls. Note the hoist in the foreground which is automatically moving into the loading station.

The solution was found in arranging the processing and plating tanks in a long, oval pattern and doing the handling with six Yale Cable King electric hoists with motor driven trolleys mounted on a closed loop-track above the tanks.

Installation of the system has provided more output in less space with less manpower and has the further advantage of permitting changes in cycle length for any or all segments of the process by the simple adjustment of control circuits and timers.

These circuits and timers, working in conjunction with travel limit switches and upper and lower hoist limit switches, control the movements of the hoists through the prescribed processing system.

The only manual handling operations in the system are at the beginning, when trays of parts are dumped into large, perforated, plastic barrels suspended from the hoists by special non-conductive load bars, and at the end of the cycle when the barrels are dumped into a hopper which in turn automatically dumps them into a dryer. From the dryer the parts are returned to their original trays ready for inspection and assembly.

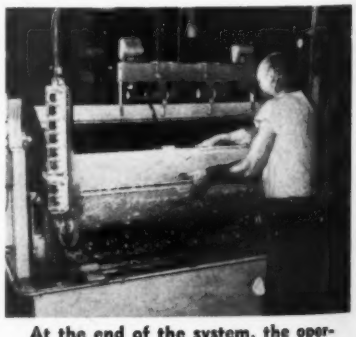
The plating operation is divided into four phases, three of which consist of several operations.

In the first phase the actions of the hoist, raising and lowering the load and travel from tank to tank, are controlled by the operator from the hoist pendant pushbutton control station. When he lowers a load into a tank, the lower limit switch actuates a remote timer which is preset to any desired time from 3 sec to 20 min.

Each of the tanks in the system is fitted with a constantly turning gear wheel that engages a gear on the barrel, rotating the load in the solution in the tank.

At the end of the elapsed time, a signal light and bell indicate that the particular operation is over and the load must be moved to the next tank. Minimum times are the only critical ones in this phase of the processing.

After removal from the last tank of Phase One, the load is ready to be cycled automatically through the next series of tanks.

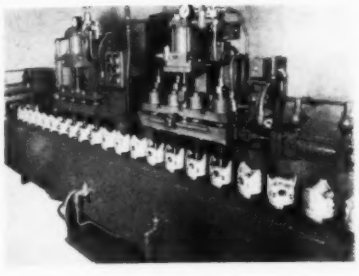


At the end of the system, the operator dumps finished, plated parts into a hopper from which they will be transferred to a dryer.

AUTOMATIC MACHINE FOR BEARING-IZING PISTON PIN HOLES

Sizing and finishing (Bearing-izing, a high speed peening process) the pin holes in automobile pistons is performed on a work handling machine as shown in the illustration. The work can be loaded manually or otherwise with the head down in a one sided nest on the conveyor platens with the pin holes in any direction.

The conveyor advances four pistons at a time with a 20" stroke placing them first under a locating unit



which rotates them to place the pin hole at right angle to the conveyor. The next station inserts a holder between the pin hole bosses and the four Bearing-izers are passed through the pistons and withdrawn. Successive indexes bring the pistons in position for unloading onto a continuous belt conveyor that carries them into an automatic weighing machine for sorting into three weight ranges. The cycle time produces four pistons in eight seconds, with accuracy for size held to 0.0002" and 5 micro-inch surface.

The machine was designed and built by Hole Engineering Service, Detroit 19.

METHOD ACQUIRED BY BLISS CUTS COPPER ROLLING COSTS BY 80%

E. W. Bliss Co. has acquired a 20% interest in Chemetals Corporation, a research organization principally concerned with the production of copper powder by chemical methods and the fabrication of copper strip, tubing, and other wrought shapes directly from the copper powder. Both processes are revolutionary to the copper industry, says Bliss.

The first is chemical. It involves the leaching of copper values from scrap, cement, matte, blister, or concentrates and the reduction of high purity copper powder directly from solution in autoclaves by gaseous reduction. This process is an extension

. . . Continued on Page 117

NOW . . .

high efficiency

Filters, Regulators, and Lubricators for Air Supply to Pneumatic Equipment

with the NEW

WATTS **high efficiency** LINE

consisting of:

WATTS high efficiency FILTER

New TORNADO ACTION

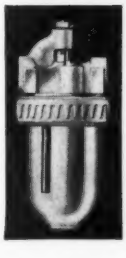
Contoured inlet eliminates drastic air pressure drop and forces the air into a downward spiral. This "Tornado Action" sets up centrifugal force which spirals dirt and moisture particles downward into the "quiet zone."

WATTS high efficiency REGULATOR

New ASPIRATOR ACTION

Watts Aspirator control acts directly on input valve, giving instant compensation for fluctuating pressure demands . . . provides precise control and stabilizes pressures reaching individual pieces of equipment.

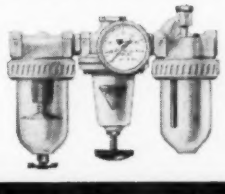
WATTS high efficiency LUBRICATOR



New BY-PASS PICKUP

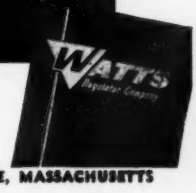
Watts new By-Pass Pickup makes possible an exclusive high velocity venturi section which vaporizes virtually 100% of the metered oil. By-Pass permits maintenance of constant pressure in the venturi section with minimum pressure loss.

Complete range of Sizes: 1/4", 3/8", 1/2"



BOWLS CAN BE REMOVED IN 30 SECONDS

Write for catalog and specification sheets on WATTS high efficiency line.



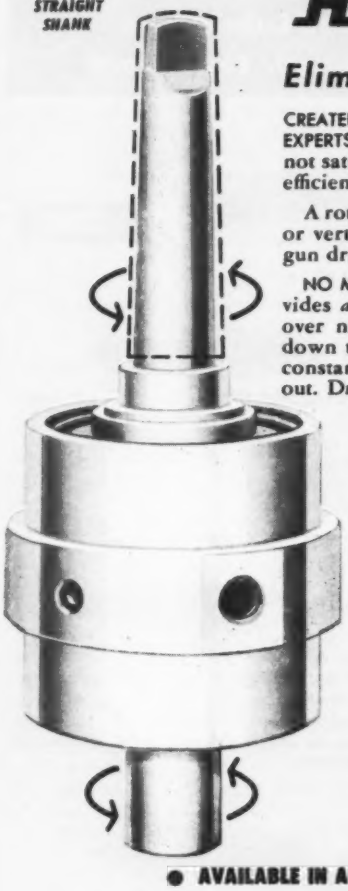
WATTS REGULATOR COMPANY SINCE 1875

14 EMBANKMENT ROAD LAWRENCE, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 115

Deep Hole Drilling Made Easy with ROTARY ACROMATIC Oil Inducer

MORSE TAPER OR STRAIGHT SHANK



Eliminates Friction and Heat Generation

CREATED AND ENGINEERED BY DEEP HOLE DRILLING AND FLUID TRANSFER EXPERTS for use in our deep hole drilling department. Existing units did not satisfy our needs. As a result—here is the ACROMATIC—a refined efficient unit, revolutionary in design and principle.

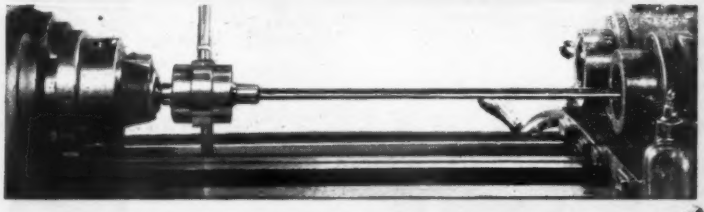
A rotary spindle adaptor for any machine tool application—horizontal or vertical where oil must be fed through a rotating oil hole drill or gun drill.

NO METAL TO METAL OR MECHANICAL SEALS—balanced oil pressure provides *a frictionless unit* reducing oil temperature build-up to only 1°F. over normal oil-pump output. This means *no mechanical failure,* no down time and no maintenance. Reliable operation is assured with a constant pressure flow of oil at the drill cutting point. Chips are flushed out. Drills cut faster, more accurately and have longer life.

TESTED 5000 HRS.—UP TO 10,000 R.P.M.—AT 1000 P.S.I.

Before offering the Acromatic Oil Inducer to industries for wide usage, we tried and tested—tried and tested. Here is a piece of equipment that has withstood months of actual shop usage.

LOWER INITIAL AND OPERATING COST—through simplified design and elimination of mechanical seals ACROMATIC gives *maximum efficiency, longer life* and *no maintenance.*



- **AVAILABLE IN ADAPTOR and THRU SPINDLE MODELS**
- **ADAPTABLE TO ALL TYPES OF DRILLING EQUIPMENT**
- **AVAILABLE FOR ALL TYPES OF OIL HOLE DRILLS**

DEEP HOLE DRILLING AT LOW COST—

ACROMATIC ENGINEERED GUN DRILLS

COST PER HOLE rather than cost per drill deserves your consideration. The practical point of view is that you buy holes at the lowest cost. ACROMATIC deep hole drills, whether of high speed steel or tungsten carbide, do give you *the lowest cost per hole*—per inch in depth—and accuracy.

Send your deep hole drilling problems to ACROMATIC—let gun drill specialists design and build your tools with cost per hole in mind.

ACROMATIC TOOL COMPANY

P.O. BOX 56

College Park Station • Detroit 21, Mich.

CUSTOMER SERVICES

- **SPECIAL HIGH SPEED STEEL AND CARBIDE CUTTING TOOLS OF ALL TYPES**
- **DEEP HOLE DRILLING LENGTHS TO 10'**
- **KING SIZE O.D. GRINDING LENGTHS TO 14'**

CIRCLE INFORM-A-GRAM KEY NO. 116

. . . Costs from Page 115

into the copper field of the same basic technology used by Sherritt-Gordon in the production of nickel powder and by Howe Sound in the production of cobalt. All are licensed under American Cyanamid patents.

The copper powder rolling process enables the powder to be fabricated directly into copper strip, tubing, and other copper or copper alloy end products without melting the powder into "cake" or ingot. This direct fabrication avoids a series of rolling operations and anneals and yields a 70-80% savings over conventional methods.

After studying the process in its own pilot plant and in Germany, E. W. Bliss is now in a position to offer fixed-cost plants accompanied by guarantees of heat, power, and labor requirements. Chemetals President Dennis K. Pickens feels that now, for the first time, plants of comparatively small size and capital cost can enter the copper field complete with saleable end products on a competitive basis.

NECROLOGY

J. Heber Parker, 75, chairman of the board of The Carpenter Steel Company, Reading, Pa., died Dec. 28.

Oscar A. Fritzell, 82, owner and founder of the Phoenix Tool & Manufacturing Company, Chicago, died in January.

Henry W. Mouw, 50, president of Royal Oak Tool & Machine Co., Royal Oak, Mich., and a director of the Automotive Tool & Die Association, was killed in an automobile accident in January.

Albert C. Lindquist, superintendent for many years of The Weldon Tool Company, Cleveland, died January 29.

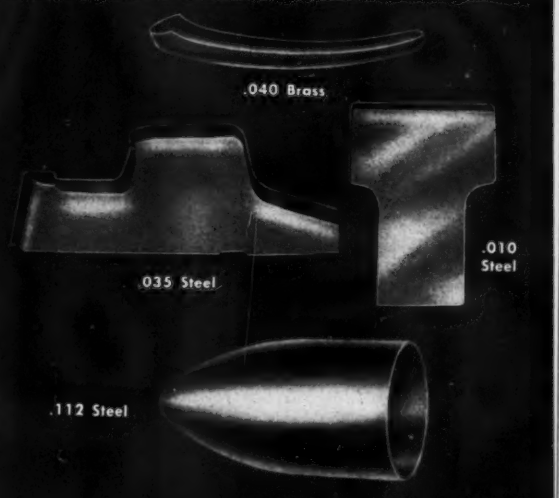
Verne W. Nichols, 61, sales manager for the Vapor Blast Mfg. Co., Milwaukee, died of a heart attack in January.

Charles A. McCormack, 77, retired general material supervisor at Allis Chalmers Manufacturing Company, died January 20 at his home in Milwaukee.

Harry E. Ladwig, 61, foundry consultant at Allis-Chalmers Manufacturing Company, died January 21 in Milwaukee.

Ray L. Howard, 61, sales engineer for Dana Corporation, died of a heart attack January 29, while driving his car through Bulter, Ind.

Eliminate Multiple Trimming Operations



Increase output . . . reduce costs!

Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness—clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials**—gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber, plastics. **Quantities vary**—stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1200 per hour. **Shapes**—fountain-pen ferrules, artillery cases, watch cases, burial vaults, automotive, kitchen, radio and television accessories and parts. Almost anything *you* need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations, are eliminated.

Submit part prints of not only the shell to be trimmed but for all related dies for our quotation.

THE SHIMMY REG. DIE

Brehm® TRIMMING DIES

SERVICES OF

YOUR TOOL ROOM in DAYTON

Engineering Processing Building

Tools . . . . Dies . . . . Special Machines

Vulcanaire Jig Grinders Motorized Rotary Tables

Brehm "Shimmy" and related dies. Automation

VULCAN TOOL CO. 731 Lorain DAYTON 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 117

Clinton E. Smith has been named assistant to the general sales manager of Pratt & Whitney Co., Inc. He has been associated with the company for the past 25 years.

◆

Richard P. Cottrell has joined the internal sales administration staff of Detroit Broach & Machine Co.

◆

Clipper Diamond Tool Co., Inc. has announced the appointment of **W. L. Wiese** as midwestern sales manager. Before joining the firm, he was with Thompson Products, Inc.

◆

Barber-Colman Co. has announced the appointment of **Peter R. Noling** as sales representative for the Machine and Small Tool Division in southern California. His headquarters will be located in Los Angeles.

◆

The newly created position of general sales manager for Precision Castings Co., a division of Harsco Corp., will be filled by **Gordon C. Curry.** A home office sales department has been established in Fayetteville, N. Y., with **Boyden W. Hindman** as manager and **J. Paul Evans** as an assistant.

◆

Robert F. Spillett has been named to the newly created position of New England tool steel supervisior for Crucible Steel Co. of America. His headquarters are located at the company's Boston sales branch in Cambridge, Mass.

◆

John F. Claydon has taken over as general manager of the Coated Abrasives Division of The Carborundum Co. He is succeeded as sales manager of the division by **Herbert P. Dales. J. G. Khoury** has been promoted to assistant sales manager of the division and **A. R. Perry** to coated abrasives field sales manager. **K. H. Wisby** is serving as field sales manager of the southwestern district. **Fred W. Scott** has become sales manager of the Bonded Abrasives Division.

The appointment of **Robert E. Blackmore** as technical sales representative has been announced by Rubber & Asbestos Corp. He will headquarter in Berwyn, Ill.

◆

J. J. Stahl has become assistant regional manager for the eastern district of A. O. Smith Corp.

◆

Tom W. Smith has been appointed general field sales manager for Champion Screw Co. He has been associated with the threaded fastener field for the last 15 years.

◆

Harry A. Skillman and **Samuel C. Longo** have been named sales engineers by E. W. Bliss Co. Both men have been assigned to the company's Southern California sales office in Burbank.

◆

Walter E. Foreman will serve as an abrasive engineer for Norton Co. Headquartering in Columbus, Ohio, he will cover the southeastern Ohio area.

◆

William R. Allen has become a service engineer for the Michigan and northwestern Ohio territory of Anocut Engineering Co. For northeastern Ohio, western Pennsylvania and western New York, **Thomas Tomezak** has been named. **Lee Johnson** will be a service engineer for the midwest region.

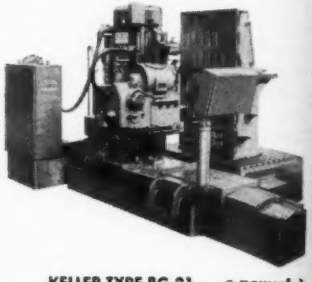
◆

Willard Dunham and **Henry Steers** have been assigned to the newly-created sales posts of assistant Western sales managers for Russell, Burdsall & Ward Bolt and Nut Co. Both posts are in the firm's Chicago office. **David Spoehr** will take over Mr. Steers' sales duties in the St. Louis territory.

◆

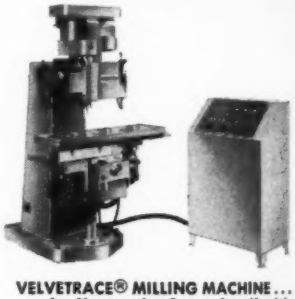
Willis D. Horner has been elected vice president in charge of sales and a director of The Allen Mfg. Co. He has been associated with the firm for almost 22 years.

A P&W Tracer-Controlled
MILLER
FOR EVERY
JOB

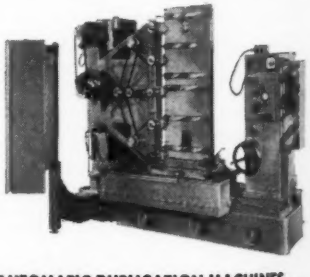


KELLER TYPE BG-21 . . . a powerful, versatile machine in a range of sizes from 5′ x 2½′ to 10′ x 4′, in single and 2-spindle models.

KELLER TYPE BL . . . a compact, powerful Tracer-Controlled Miller for work within the range of 36″ x 20″. With all new Keller features. Single and 3-spindle models.



VELVETRACE® MILLING MACHINE . . . duplicates the finest detail with extreme precision. New, non-contacting tracer control cannot damage the softest, most fragile 3-dimensional models.



AUTOMATIC DUPLICATION MACHINES . . . automatically reproduces original forging dies and glass or plastic molds with remarkable precision and detail. Two versions, one for molds, one for dies, with 1, 2 or 4 spindles.

CIRCLE INFORM-A-GRAM KEY NO. 119

PHOTO COURTESY OF ALUMINUM COMPANY OF AMERICA

To machine the WORLD'S LARGEST DIE,

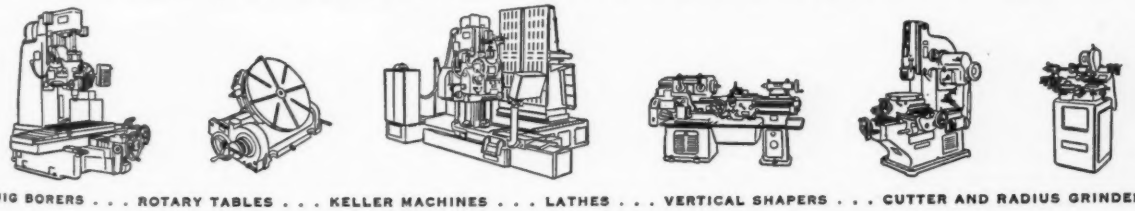
ALCOA chose the Keller . . .

. . . AUTOMATIC TRACER-CONTROLLED MILLING MACHINE

Consisting of two halves, each weighing 30 tons, this is the world's largest closed die block. Designed to forge aluminum backbones of fuselage and wing structures for the new multi-jet Martin SeaMaster, this giant die was produced on a P&W Keller BG-22 at the U.S. Air Force Heavy Press Plant operated by Aluminum Company of America.

Chances are that your own workpieces aren't as large as this die, but there is a Pratt & Whitney Keller Automatic Tracer-Controlled Miller for *every* worksize requirement. *Every* Keller Machine offers the same important advantages: fast, accurate reproduction of complex 3-dimensional shapes, extreme versatility and an overall ability to produce highest work quality economically. These advantages will also make Keller *your* first choice for a wide variety of die, mold and other hard-to-handle 2- and 3-dimensional milling jobs. Write now for complete information.

Pratt & Whitney Company, Incorporated, 15 Charter Oak Boulevard, West Hartford, Conn.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

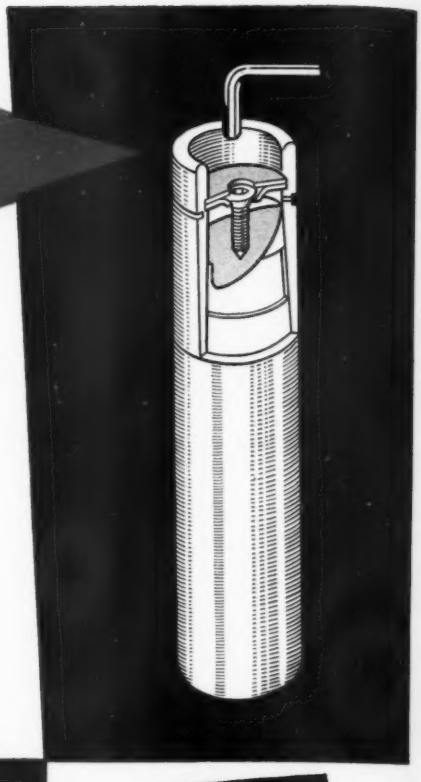
PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 119

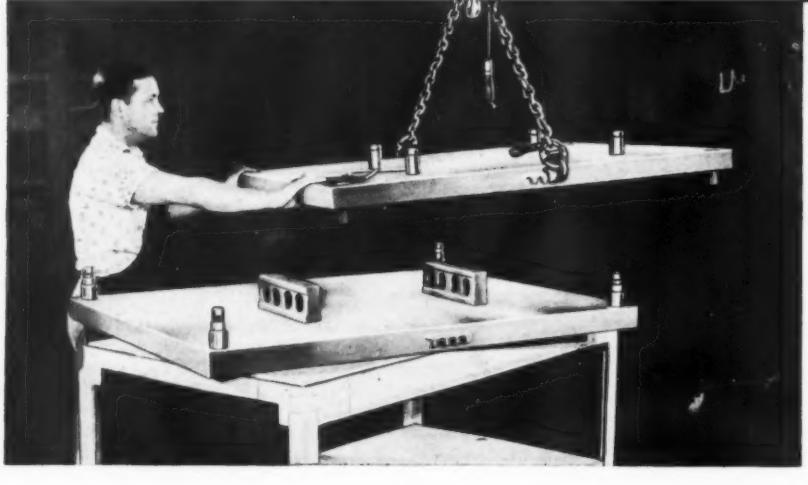
NO DIE SET PARTING PROBLEMS SUPERIOR REMOVABLE CAP GUIDE PINS



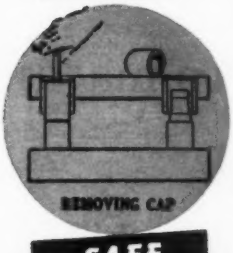
NOW on every SUPERIOR DIE SET in diameters from 1½" upward at no additional cost

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can do this work alone in a few minutes.

Standard equipment on all Superior die sets. Specify if desired. Write for complete free information.

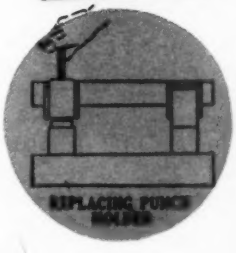


FAST



SAFE

ACCURATE



for fast local service call these expert Superior representatives

Kalamazoo, Mich. Fireside 5-7988
Indianapolis, Ind. Clifford 5-5668
Rockford, Ill. 3-3931
Dayton, Ohio Hemlock 6209
Chicago, Ill. Randolph 6-8871

St. Louis, Mo. Jeff 5-1223
Dallas, Texas Riverside 5138
Winter Park, Fla. 4-0464
Minneapolis, Minn. FR 1-1321
Memphis, Tenn. 33-7727

East Orange, N. J. Orange 5-5810
Denver, Colo. Enterprise 234
Agawan, Mass. Republic 9-1132
Madison, N. J. Frontier 7-0407
Schenectady, N. Y. Franklin 2-4381

North Haven, Conn. Cedar 9-1661
Racine, Wis. Melrose 2-1900

Plants at
Milwaukee, Wis. Mitchell 5-6027
Plainville, Conn. Sherwood 7-2761

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 120

Business Management Aids

"North Carolina Industrial Location Factors" details the advantages of plant locations in the state. Separate sections are devoted to plants, labor, taxes, markets, finances, transportation, industrial resources and social features, such as education. Also given are facts on the state itself. The North Carolina Department of Conservation and Development, Raleigh 11, N. C., will provide copies of the brochure, or — **Circle Inform-A-Gram No. F1.**

Industrial Opportunities and Plant Site Data on Long Beach, Calif., are highlighted in an illustrated booklet. Discussed are the labor supply, climate, utilities, power, gas, taxes, and water. Emphasized is the stability of Long Beach's economy with its diversity of industry. For your copy of the brochure, write to Long Beach Chamber of Commerce, Long Beach 2, Calif., or — **Circle No. F2.**

"What Is the Best Spot for You?" This booklet points out that the Chesapeake and Ohio Railway's territory can provide nearness to raw materials and fuel, accessibility to markets, dependable labor and good water. A map shows the entire territory and then the booklet goes on to detail each section. For complete information, obtain a copy of the booklet from Chesapeake and Ohio Railway, Terminal Tower, Cleveland 1, or — **Circle No. F3.**

How an Internal, Company-Owned Telephone System Can Be Used to economically reduce paperwork and speed operations is described in an illustrated brochure. Discussed is the importance to the company of saving time, cutting costs, establishing closer administrative control and improving customer relations. Direct requests for copies of the brochure to Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, or — **Circle No. F4.**

"Look Where a Site Is Production-Right" has been issued by Baltimore & Ohio Railroad, Baltimore 1, Md. It suggests advantages in plant location and expansion found in the territory served by B & O. Maps are included showing the location of power and fuel, labor, key materials of production and the markets. One map is devoted to the water and weather of production. For your copy of the brochure, contact B & O, or — **Circle Inform-A-Gram No. F5.**

A Primer on Digital Computation has been published by Computer Control Co., Inc., 92 Broad St., Wellesley 57, Mass. The booklet helps to show the important rudiments upon which digital machine computation is based. The machine's operation conforms to rules of symbolic logic and most of its calculations are based upon a system of binary, rather than decimal, numbers. For copies, contact the company, or — **Circle Inform-A-Gram No. F6.**

An Enlarged Line of Industrial and Commercial Buildings, and accessories are detailed in an illustrated catalog. Featured are the new Stran-Steel series of rigid frame structures, two 50 and 60 ft bow string truss buildings and the recently developed Stran-Satin metal wall. Shown are various uses of the easily erected buildings. Direct requests for copies of the catalog to Stran-Steel Corp., Detroit 29, or — **Circle Inform-A-Gram No. F7.**

Industry in Indiana is covered in a booklet from the Indiana Department of Commerce and Public Relations, 333-A State House, Indianapolis 4. It discusses why debt-free Indiana is attracting more industry than any other state per capita. **Circle Inform-A-Gram No. F8.**

Faster Switching, Hauling and Spotting are possible with the Whiting Trackmobile. This versatile car mover can travel on both road and track. It makes freight car movements less time consuming and less expensive. Complete information is found in Bulletin T-122, "How to Speed Up Freight Car Movement and Reduce Costs," put out by Whiting Corp., Harvey, Ill., or — **Circle F9.**

The State of New York is detailed in the brochure, "Industrial Location Factors," supplied by New York State, Dept. of Commerce, 112 State St., Albany 7. Discussed are raw materials, transportation, markets, labor, power and fuel, water and available buildings. The Department of Commerce will also make available a physical map of the state. For both of these publications, contact the Department of Commerce, or — **Circle Inform-A-Gram No. F10.**

"The Role of Air Freight in Physical Distribution" has been released by Emery Air Freight Corp., 801 - 2nd Ave., New York 17. A review of this study covers such subjects as the overall economy of air freight and how it is used, the relationship between air freight and production and flow, and the cost of ownership of inventory. Also discussed are the effect of air freight on the high cost of inventory, warehousing costs and total cost concept as applied to air freight and distribution. **Circle Inform-A-Gram No. F11.**

"Data for Decision" describes the ALWAC 800 electronic processing system. The system can automatically process data stored on punched cards, magnetic tape and high speed punched paper tape. In addition, high speed line printers and/or electric typewriters can be used for output. All functions — calculation plus input and output — can be performed simultaneously. The bulletin also covers specifications and applications. Obtain copies of "Data for Decision" from Logistics Research Inc., 141 S. Pacific Ave., Redondo Beach, Calif., or — **Circle Inform-A-Gram No. F12.**

"Arizona Industrial Facts" is a folder covering all the aspects of the state of particular interest to industry. Included is a brief of major tax law provisions affecting business and industry. A map is discussed dealing with natural (non-metallic) resources. Other maps show the origins of labor supply, power generating stations, railway systems, truck gateways and local and regional air service. Charts point out air and rail passenger travel time and motor freight time. Copies of the folder are made available by Arizona Development Board, 1521 W. Jefferson St., Phoenix, Ariz., or — **Circle Inform-A-Gram No. F13.**

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

Why you should use the Jig Borer and Jig Grinder to inspect their own work

In more than 90 per cent of all cases, the Moore Jig Borer and Jig Grinder provide the most accurate and efficient means for inspecting their own work. The advantages include:

1. Considerable saving of time results from checking the piece in the original setup, *while still in the machine.* In addition, should an error be discovered—the work is *in position* for correction.

2. The same directness which reduced sources of locational error in comparison to toolmaker error also reduces the number of steps and sources of error in inspection.

3. The machine's measuring system is fully as accurate as *any* standard that might be used in its stead. The inspection values, determined by means of this system, are likely to be *more* accurate than those attained by any other shop standard because reorientation errors are eliminated.

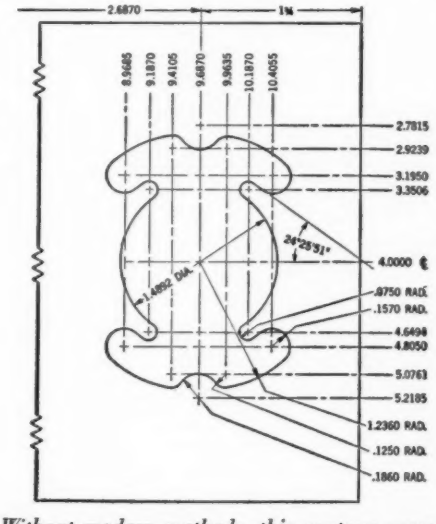
4. The machine spindle provides a rotatable mounting for an indicator. Holes can be picked up directly in this manner, without use of plugs or pins. Out-of-roundness, often mistaken for out-of-location, is easily detected and identified. Full 360° rotation of spindle provides a double indicator reading of any error, thus increasing readability. By vertical movement of the spindle and indicator the shape of the hole can be explored, revealing taper, bellmouth or barrel shape.

5. Contours, one of the most difficult, time-consuming jobs of inspection, can be rapidly and accurately measured and inspected by use of the "indicator measuring" technique. The drawing at the right shows dimensions to be inspected on a complex contour. Of this job it might well be said, "How *else* would you inspect it?"

6. Work jig bored or jig ground to *polar* coordinates on the rotary table can be inspected to *rectangular* coordinates in the same setup. This not only provides a check on possible errors in settings; it eliminates sources of rotary table errors.

7. Paradoxically, the machines will actually inspect somewhat more accurately than they will locate, under most conditions. During inspection, both machine and work are free of vibration, stresses and temperature differentials, so that the accuracy of the measuring system is undiminished.

8. A microscope, interchangeable with the indicator in the machine spindle, can pick up surfaces and small holes which cannot be conveniently reached with an indicator point.



Without modern methods, this contour presents a serious problem to inspect as well as to machine.

Get ALL the answers from this new, 424-page book

The information on this page is just a sample of the valuable, on-the-job aid you can get from Moore's *all-new* book, HOLES, CONTOURS AND SURFACES. Tells you how to produce tools, dies and precision parts *the modern way.* 424 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere Send check or money order to Moore Special Tool Co., Inc., 726 Union Ave, Bridgeport 7, Conn.

STAINLESS AWARD COMPETITION OPENS

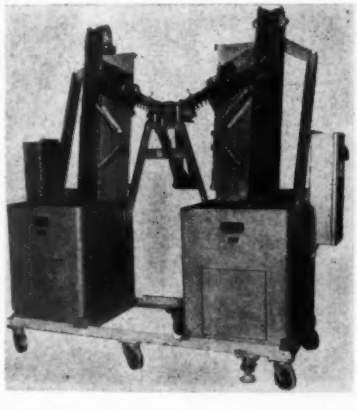
Competition for the Second Allmetal Annual Stainless Steel Awards, worth $1500, has been opened by their sponsor, Allmetal Screw Products Company, Inc. of Garden City, N. Y. Awards will be presented for the best case histories describing the use of stainless steel fasteners as an ultimate cost-reduction factor in product manufacturing. Deadline for all entries is June 1.

STANDARD COMPONENTS BUILT INTO SPECIAL HANDLING EQUIPMENT

Automatically feeding workpieces to a machine usually requires equipment of special design. However, the adaptation of standard components to special applications is often possible.

By way of illustration, examples are given of how Feedall, Inc. met two special problems by modification of standard components.

Faced with the problem of feeding two streams each of two different sized parts to a production machine at one time, they came up with the



ingenious device of using two of their Model 2200 Feeders — one left and one right hand delivery — mounted together and combining their delivery chutes to feed four streams of oriented parts at one time to an Avey automatic drilling machine.

Each feeder feeds a stream of oriented parts into a delivery chute where they are subdivided by a shuttle device into two chutes thus providing the four streams of parts which the Avey drilling machine will accommodate.

The two Model 2200 units are made fully portable by being mounted on a single base with heavy casters.

. . . Continued on Page 124

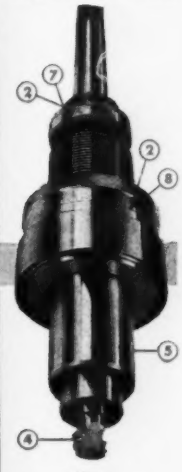
For almost any internal grooving problem . . .

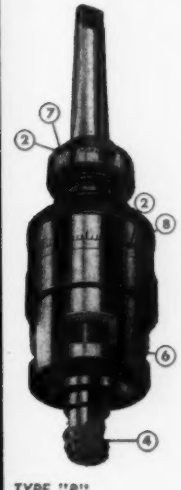
PREMIUM QUALITY RECESSING TOOLS

DESIGNED BY SCULLY-JONES TO CUT CAPITAL AND OPERATING COSTS

These benefits	. . for these reasons	. . result from these PREMIUM features
REDUCE COSTS	Minimize need for special machinery.	1. Simplify intricate recessing and grooving operations on standard machines, such as drill presses, radial drills, turret lathes, and chucking machines.
	Reduce skill requirements and labor costs.	2. Position tool and control depth of cut automatically.
	Eliminate downtime.	3. Hardened and ground parts assure long life and trouble-free operation on precision work.
	Cut tooling costs.	4. Interchangeable tool bit holders or circular form cutters easily and quickly adapt tool for a variety of special operations.
		5. Hardened and ground steel pilot fits standard bronze bushing.
		6. Interchangeable hardened and ground steel pilot or stop collar made to suit specific requirements. Stops against and pilots in work.
INCREASE ACCURACY	Simplify accurate settings.	7. "Quick-Lock" nut sets depth of undercut to within .001 in.
		8. Adjustable stop collar assembly locates position of undercut in hole to within .001 in.
INCREASE PRODUCTION	Speed operations.	9. Adjustments controlling location and depth of groove are simple and fast.
		10. Positioning of tool and cutting cycle are fast and efficient.

TYPES "J" AND "C"
Pilot in fixture bushing. Can be modified to pilot *in* and stop *against* work.





TYPE "R"
Pilots *in* and stops *against* workpiece.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

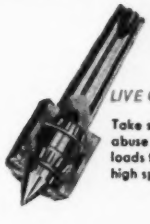
"Precision Holding" for holding precision

Scully-Jones and Company, 1913 South Rockwell St., Chicago 8, Ill.

for profit-minded tool buyers!

COUNTERBORES and COUNTERSINKS

Give you rigidity and concentricity needed for accurate work, longer life.



LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.

"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.

CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.

DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

CIRCLE INFORM-A-GRAM KEY NO. 123

Zagar Gearless Drill Heads

put 4 big advantages to work for you

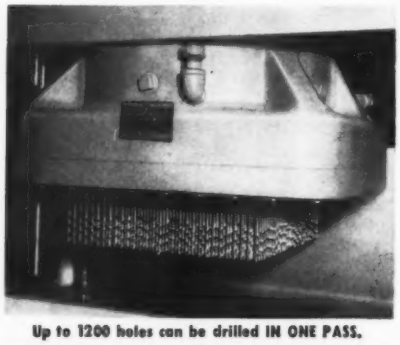
Any number of holes

Any hole pattern

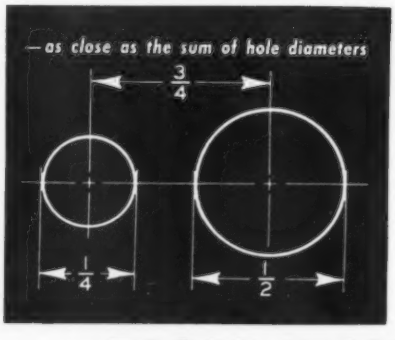
Any material

On all centers

Any hole pattern—on any center up to 1½" dia.



Up to 1200 holes can be drilled IN ONE PASS.



A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.

Can you visualize the savings made possibe by drilling up to 1200 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer — one *best* answer — for those requirements. May we supply it?

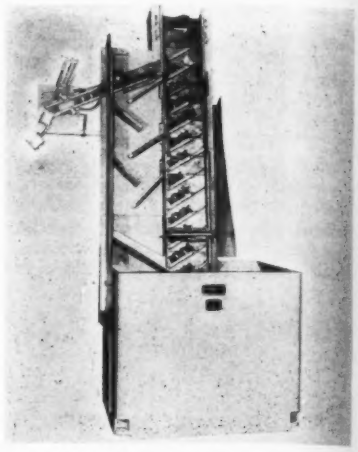
Get more information via Zagar's Engineering Sheets "T-3".

ZAGAR INCORPORATED
23894 LAKELAND BOULEVARD, CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 124

. . . Equipment from Page 123



On the other job, the single unit shown was a modification of Feedall Model 2500 that was designed to automatically feed universal joint spiders to a special Landis centerless grinder, where all four diameters are ground in one operation.

The parts were placed in the 9 cu ft capacity hopper from which they were taken by the elevating conveyor to the delivery chute and then, properly oriented, were delivered to the Landis centerless grinder.

TWO MACHINES PROCESS SIX DIFFERENT AIR COMPRESSOR BLOCKS

A pair of new dial type machines, arranged to process six different air compressor cylinder blocks, have been developed to rough and semi-finish bore the cylinders; rough and finish counterbore the valve ports; and drill, chamfer, and ream all other necessary holes. To prepare them for this processing, the parts are milled on top, bottom, and sides.

The first machine is equipped with a 4-station index table, and the second machine with a 6-station index table. Indexing is automatic and is fully interlocked with the machine cycle. Both machines are equipped with 2-position, progressive work holding fixtures with interchangeable adapters for the six different parts.

Rated capacity of these two machines, built by The Cross Co., is 129 cycles/hr at 100% efficiency.

According to Cross engineers, an outstanding feature of the machines is their flexibility for part design changes. The machines are constructed on the Cross "building block" principle. Complete interchangeability of parts, even to tooling details, provides fast, easy maintenance and reduced downtime.

carbon-stabilized

PARKER-KALON stress relieved socket screws

All P-K® Socket Screws are hardened in a propane atmosphere in this Westinghouse furnace to prevent carbon loss, eliminate adsorption of foreign gases. Part of P-K's controlled processing which assures consistent high quality, prevents precipitation or crystallization. Another good reason why . . . *If it's P-K . . . It's O-K!*

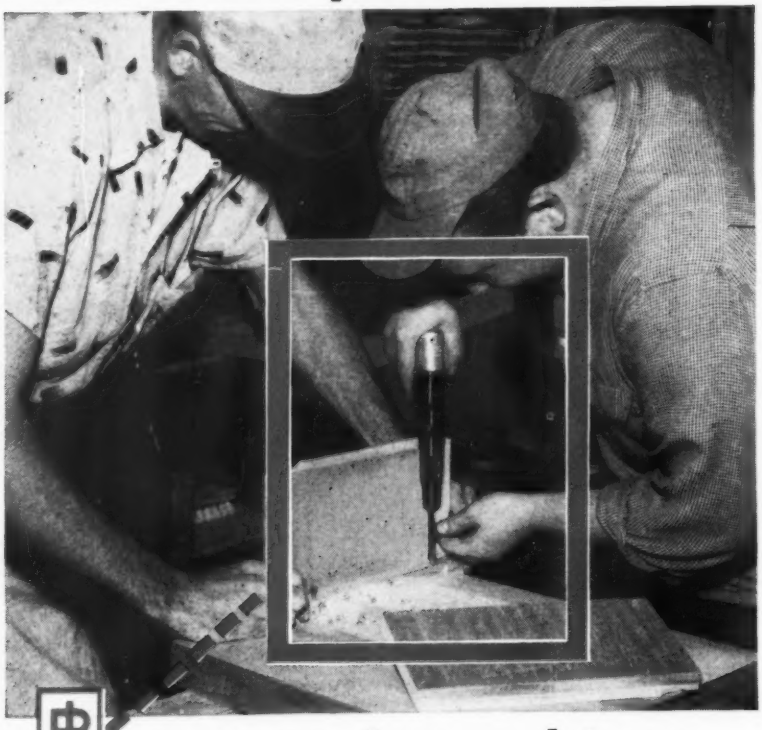
PARKER-KALON DIVISION, General American Transportation Corporation • Manufacturers of Socket Screws, Self-tapping Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws.

Sold Everywhere Through Leading Industrial Distributors — Factory: Clifton, New Jersey • Warehouses: Chicago, Illinois, Los Angeles, California

PARKER-KALON® fasteners

CIRCLE INFORM-A-GRAM KEY NO. 125

is there a COST-SAVING idea in this picture for you?



air-powered screw drivers end handwork in close quarters

*Exceptionally small side-to-center distance of this Ingersoll-Rand air-powered screw driver permits running screws that electric tools can't reach and that formerly had to be driven by hand.

AIR engineering at work
REPORT No. 4211.05

The men pictured above are saving $1.35 on a single unit. That's a saving of $87.75 a day for their company. Production has increased 160% since the two men changed from a combination of electric tools and hand methods to I-R Air-Powered Screw Drivers. At this rate, the I-R tools *paid for themselves in 3½ days!*

Can you picture a similar saving in your plant? An I-R AIRengineer, with over 1000 sizes and types of air and electric tools to work with, will gladly analyze your assembly operation and make recommendations without obligation. Write today!

Ingersoll-Rand
11 Broadway, New York 4, N.Y.
CIRCLE INFORM-A-GRAM KEY NO. 126

What's New In Plastics

A Summary Chart, outlining the physical and electrical properties of epoxy resin systems, has been prepared by Permacel Tape Corp., Dept. ER, New Brunswick, N. J. Listed are 25 different systems handled by the company with technical information such as the average pot life of the resin in a 100 gram mass at 80°F and volume resistivity. Get copies of the chart from the company, or — **Circle Inform-A-Gram No. E1.**

Designed for Casting or Surface Coat Applications is Epoxical metallic casting resin. It is a dimensionally stable tooling and pattern making resin, which will cure or harden at room temperature. The preparation of the mold surface and mixing and pouring the resin is discussed in a bulletin. For your copy of Bulletin IGL 401, write to U. S. Gypsum, 300 W. Adams St., Chicago 6, or — **Circle Inform-A-Gram No. E2.**

Engineering Data on High Standard High Strength Epoxy Resin Adhesives for metal to metal bonding and honeycomb sandwich construction is given in an 11-page bulletin. Information is presented on five representative epoxy resin adhesives which offer all the advantages of this type product. Properties and performance data of room temperature and elevated temperature curing types are discussed. Also included is general information, product description, application and curing procedures. Comparative performance data of these and other high strength adhesives is also described in detail. Copies of the bulletin are made available by Minnesota Mining and Mfg. Co., Adhesives and Coatings Div'n, 423 Piquette Ave., Detroit 2, or — **Circle Inform-A-Gram No. E3.**

A Hopper-Dryer with Automatic Jet Loader is detailed in a bulletin from Thoreson-McCosh, Inc., 18208 W. McNichols, Detroit 19. The unit is used on injection molding machines and thermoplastic extruders for preheating and drying the material to insure proper production and increase production. The bulletin lists the features and specifications of the unit. In addition, it pictures typical installations for injection and extrusion operations. Copies of the bulletin are issued by the company, or — **Circle Inform-A-Gram No. E4.**

A Chart Listing 28 Electrical and Physical Properties of 11 standard grades of fiberglass-reinforced polyester laminates has been published by The Glastic Corp., 4321 Glenridge Rd., Cleveland 21. It is designed to help users of electrical insulation select material for Class B temperature applications. The chart is divided into three sections — one for rigid laminate grades, one for flexible laminate grades and a third for phenolics. All standard grades of Glastic laminate are described on the back of the chart. Contact the company for a copy of the chart, or —
Circle Inform-A-Gram No. E5.

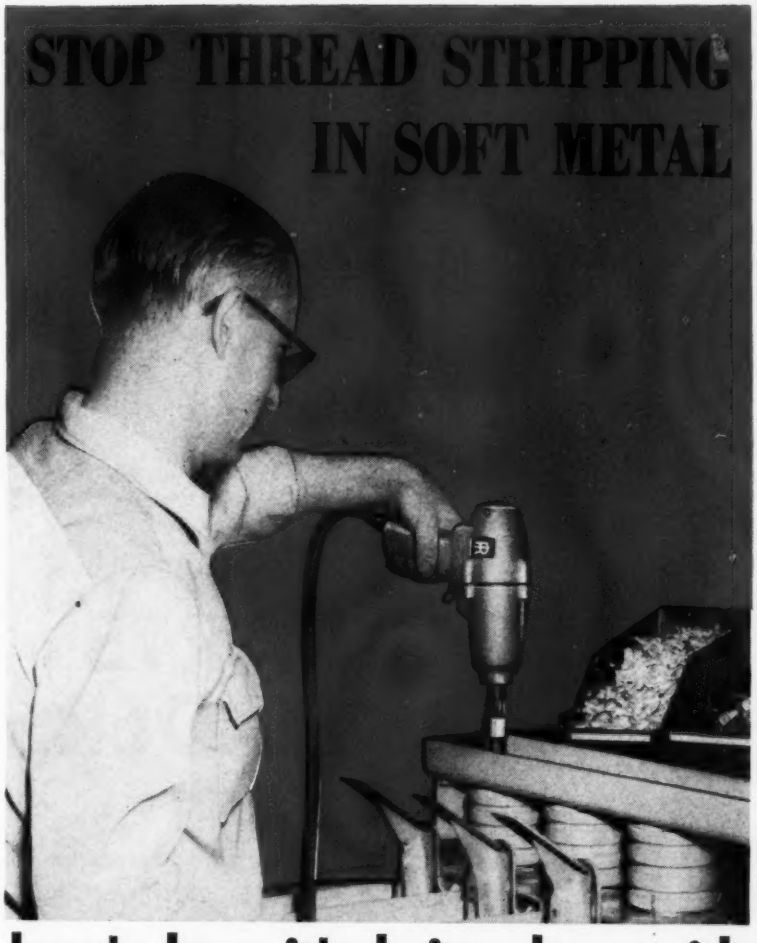
The Chromalox Electric Heater Band gives accurate, unvarying heat at any barrel temperature up to 700°F. Bands are easy to install, remove or interchange. The bands are available in standard radii to fit most extrusion and injection barrels. Bulletin SP-2508 with details, and dimensions is made available by Edwin L. Wiegand Co., 7860 Thomas Blvd., Pittsburgh 8, or —
Circle Inform-A-Gram No. E6.

A Thermoplastic Injection Press has been designed for experimental short runs, small precision parts, patterns for castings, etc. Model A-2 operates on a 100-125 lbs psi line pressure. It has a ¼ oz capacity. For details and specifications, request a circular from Simplomatic Mfg. Co., 4416 W. Chicago Ave., Chicago 51, or —
Circle Inform-A-Gram No. E7.

Produce All Types of Laminated Products with a 2200-ton water-hydraulic press which speeds up loading and unloading and prevents damage to loading and steam plates. The press is of rigid construction to eliminate sway and minimize deflection. Further information on the press is supplied by Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa., or —
Circle Inform-A-Gram No. E8.

A Line of Phenolic Molding Materials and Resins is described in illustrated Brochure CDC-322 issued by General Electric Co., Chemical Materials Dept., 1 Plastics Ave., Pittsfield, Mass. Presented is detailed technical data, special properties and product features of phenolic molding powders, industrial and foundry resins, and others. Obtain copies of the brochure from the company, or —
Circle Inform-A-Gram No. E9.

. . . Continued on Page 128



here's how it's being done with Ingersoll-Rand

TORQUE CONTROL impactools!

If you assemble soft metal threaded parts, such as aluminum or bronze, take a look at the improvement record made by this large electrical manufacturing company.

Parts spoilage is substantially reduced and product quality greatly improved since changing from conventional air powered wrenches to new Ingersoll-Rand Torque Control Impactools for running nuts and cap screws. These revolutionary Impactools shut off instantly and automatically when the preset torque is reached. No more stripped threads . . . and every fastener is precisely tightened for top quality.

Call or write for bulletin 5170, or ask for an obligation-free demonstration.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

8-523

CIRCLE INFORM-A-GRAM KEY NO. 127

SYNTRON

"Vertical-Vibratory"

PARTS FEEDERS

Syntron Parts Feeder with gravity feed track and controlled escapement.

Provide, high-count oriented feeding of small parts to automatic machinery.

SYNTRON Parts Feeder with their gentle vibrating action and instant controllable rate of feed, successfully handle glass, ceramic finished parts that are impossible to handle with mechanical feeders. Parts that were once limited to slow manual feeding.

SYNTRON Parts Feeder save man hours, increase production, cut production costs by transforming ordinary deburring, marking, indexing assembly, packaging and other machinery into economic, efficient, dependable automatic operations. They are easily installed, adaptable to automatic machinery by means of a gravity feed track with controlled escapement, as illustrated above. Each Syntron Parts Feeder is custom designed for parts to be handled.

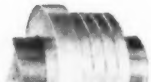
Send samples and details to our applications engineers for complete information and recommendation.

Other Syntron Equipment of Proven Dependable Quality

BIN VIBRATORS

ELECTRIC HAMMERS

SHAFT SEALS



Write for Syntron Complete Equipment Catalog — FREE

SYNTRON COMPANY

341 Lexington Avenue Homer City, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 128

. . . Plastics from Page 127

Join Metals and Non-Metals without Pressure using Formula 800 epoxy resin preforms. They bond by thermal setting without the application of pressure. Formula 800 epoxy resin bonding is supplied in preforms for easy assembly of the finished product from parts that are to be joined. A self-contained catalyst makes possible a preform in almost any desired shape. The preforms bond, join and pot metal to metal, metal to non-metals, non-metals to non-metals; and are used for hermetic sealing, for metal-to-ceramic joining, sealing lead wires and capacitors, and for making temporary tools, jigs and fixtures. For details, see Bulletin 26 from Atlas E-E Corp., 47 Prospect St., Woburn, Mass., or —

Circle Inform-A-Gram No. E10.

Boltaron Moldable Sheet Plastic can be machined, sheared, sawed, punched, drilled, cemented, hot stamped, etc. This high-impact strength material combines many of the advantages of both plastic and rubber. A brochure details its uses, fabrication, the different types of Boltaron that are available and the physical and chemical properties. The General Tire & Rubber Co., Bolta Products Div'n, Lawrence, Mass., will release copies of the brochure, or —

Circle Inform-A-Gram No. E11.

The 1957 Condensed Reference File of Bakelite Plastics has been published by Bakelite Co., Div'n of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17. Distinguishing characteristics, appropriate fabricating techniques and major fields of application are clearly defined for each different group of plastics. More than 80 photos and sketches illustrate some typical uses of the materials. Charts indicate the wide variety of plastics by major methods of fabrication. The company will provide copies of the reference file, or —

Circle Inform-A-Gram No. E12.

Drape and Vacuum Forming Machines are described and illustrated in Bulletin 56 from The Auto-Vac Co., 1984 State St. Ext., Bridgeport 5, Conn. Detailed are the construction features and operating cycle of the vacuum and drape forming machines. Also covered are the industrial uses and the materials to select from for working with vacuum forming. Copies of the bulletin are supplied by the company, or —

Circle Inform-A-Gram No. E13.

Lightweight magnesium fixture checks Ford station wagons

This magnesium checking fixture is used by Ford Motor Company in assembling Ford two-door station wagons.

It helps to maintain quality by checking the daylight opening relationship to the glass run channel and regulator retainer brackets in the quarter panel welded assembly. It assures accurate location of the glass run retainers and window regulator mounting holes. The fixture is dimensionally stable and has stood up well under continuous rough handling. One man can easily lift and manipulate it with one hand.

Jigs and fixtures made with magnesium are always easy to handle because they weigh much less than steel or aluminum. Magnesium tooling plate is uniformly flat, low in cost and easy to machine, fabricate and weld.

For the full story on magnesium tooling plate contact your nearest supplier of Dow magnesium or write to us.

THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1416W.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif. Vinson Steel and Aluminum Co., Dallas, Texas.

YOU CAN DEPEND ON DOW

CIRCLE INFORM-A-GRAM KEY NO. 129

VAN NORMAN

No. 4BG1 Bowgage Production Grinder

10 Tons of Massive Rigidity

for Extra Precision, Performance and Economy in Mass Production Grinding

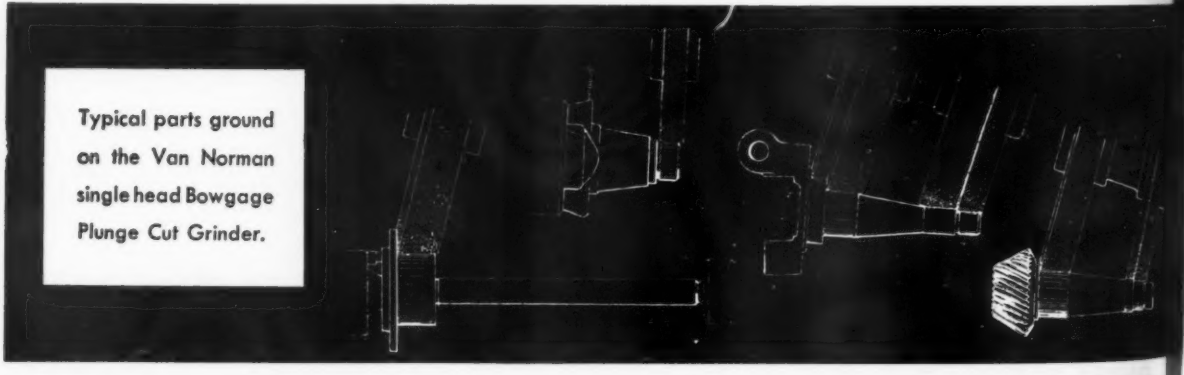
The No. 4BG1 Bowgage plunge cut grinder was developed for a leading automotive manufacturer for grinding pinion shafts. This 10 ton brute assures extreme accuracy and increased production by 50%.

Van Norman production grinders feature the exclusive Van Norman Bowgage wheelheads.

These rugged heads are completely self-contained grinding units with feed-back gauging, size compensation, and exclusive diminishing feed, and automatic cycling. By simply taking one or more Bowgage wheelheads and mounting them on a suitable base, there is practically no limit to the number of diameters, tapers, shoulders, etc. that can be ground to close tolerances automatically. Automatic size control to .0002" plus multiple step contour grinding can assist you to increase production, cut grinding costs. Formed dressed wheels can be profiled to accomplish step grinding for as many as 6 diameters at one time.

Specialized application in precision grinding for mass production can be designed into single or double head grinders to fit your particular requirements.

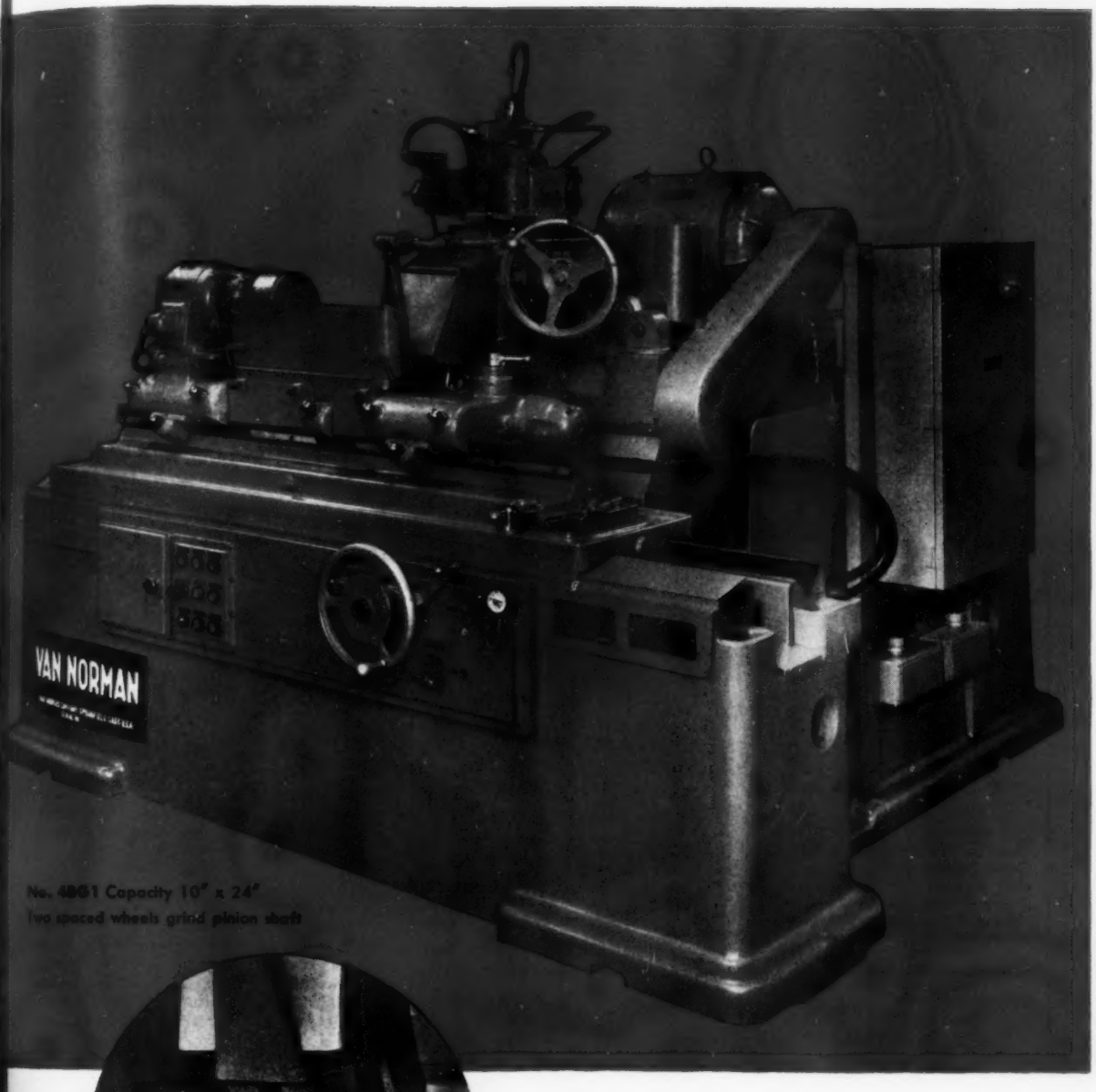
Write for catalog or engineering assistance.



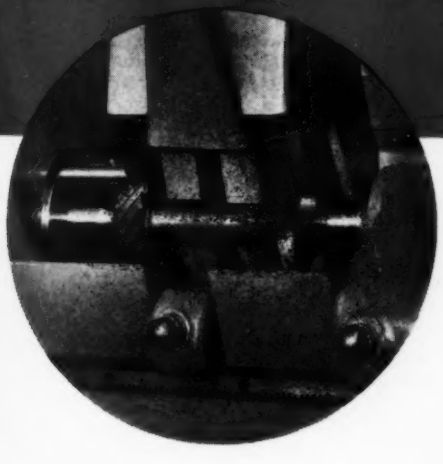
Typical parts ground on the Van Norman single head Bowgage Plunge Cut Grinder.

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



No. 48G1 Capacity 10" x 24"
Two spaced wheels grind pinion shaft



Don't wait . . . for extra profits install a Van Norman Machine now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years . . . See your dealer or write Van Norman Machine Company.

Conditional Sales Contracts not available to Export.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 131

Lepel HIGH FREQUENCY *Induction* HEATING UNITS

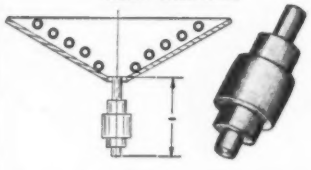
BRAZING
HARDENING
BOMBARDING
SOLDERING
ANNEALING
MELTING

The Lepel line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating.

If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

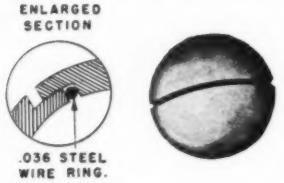
TYPICAL INDUCTION HEATING APPLICATIONS

TEMPERING FOR CUSTOM HEAT TREATING



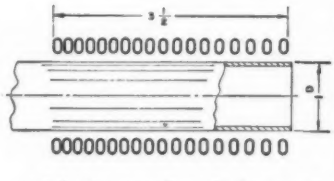
Selected areas of hardened steel parts may be tempered for fabrication or service requirements. Concentrator type coil permits high power density in restricted area thus minimizing heating time and permitting marked variation in properties in adjacent sections.

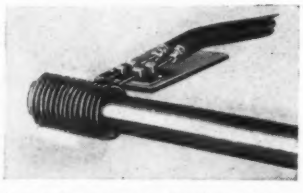
WIRE RING JOINS PLASTIC PARTS



High frequency induction heats wire ring which in turn heats plastic wall, providing sufficient plasticity to cause flow and bonding upon application of pressure. Metal to plastic seals are similarly performed.

ANNEALING ALUMINUM FURNITURE TUBING

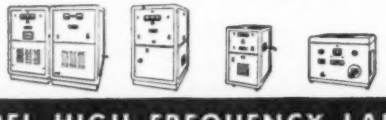




Selective annealing of aluminum furniture tubing permits bending where required without loss of strength in adjacent portions of tube. Brass or steel tubing is also being selectively annealed.

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.



All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

At Your SERVICE

Elevated temperature tests are conducted by the laboratories of The Frank L. Crobaugh Co. of Cleveland. Such tests are needed in the development of new alloys used in modern aircraft flying at super-sonic speeds. The company also acts as consultants to foundries, the processing industries, and the metal finishing trade.

◆

High-speed automatic finishing for die castings is performed by a series of highly integrated finishing departments recently completed by Precision Castings Co., division of Harsco Corp., located in Syracuse, N. Y. These facilities, costing more than one-half million dollars, include automatic equipment for cleaning; copper-nickel, and chrome or brass plating; phosphate coating; electrostatic spray painting; baking; and polishing. Special emphasis has been given to more extensive cleaning and improvement of undercoating methods.

◆

Saffran Engineering Co., St. Clair Shores, Mich., handles precision machining of titanium, stainless and alloy steels, plus welding. These facilities enable the company to provide a well-rounded service to the aircraft industry.

◆

A $500,000 job plating plant to serve the automotive, electronic, appliance, and metal fabricating fields has been finished by Adolph Plating, Inc. of Chicago. The company specializes in cadmium, zinc, and copper plating. Featured in the new plant is a 225-ft electro-plating line.

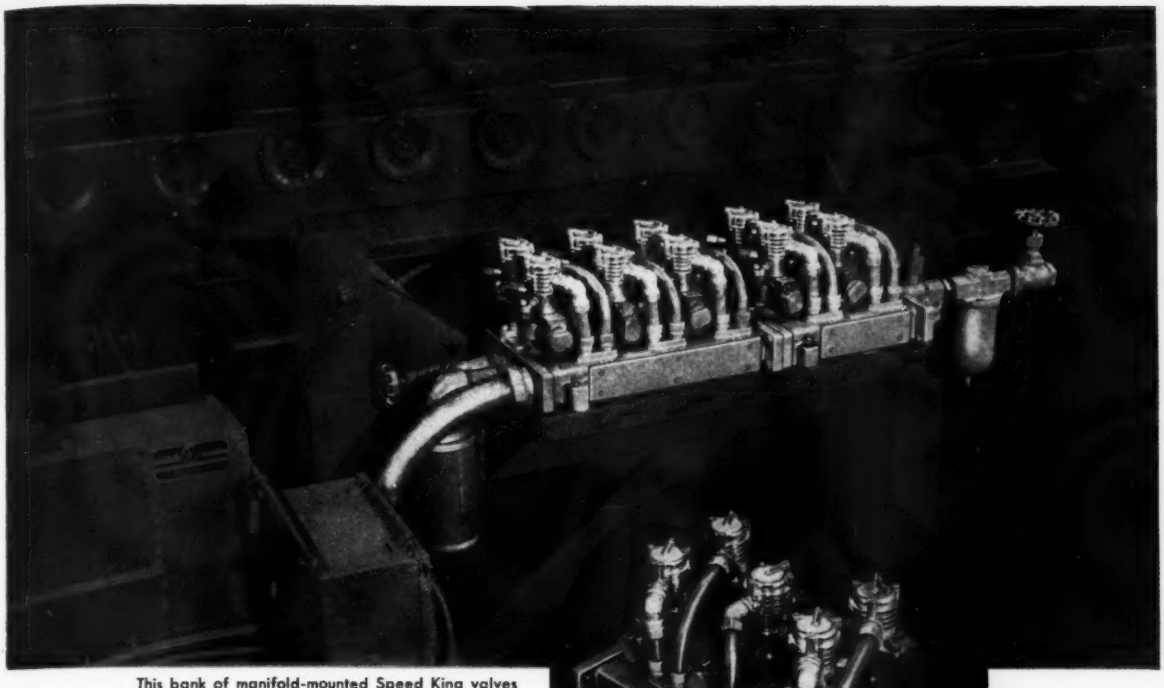
◆

A complete range of induction vacuum melted super-alloys is now being offered by Firth Sterling, Inc. of Pittsburgh. The company will process ingots produced by Kolcast Industries Inc. into mill products such as billets and hot and cold finished bars, and will assume complete responsibility for marketing these products.

◆

American Brake Shoe Co. has entered the specialty aluminum castings business. Limited production in a pilot foundry has been under way for over a year and a new aluminum foundry is under construction at Mahwah, N. J. The aluminum castings are being used by aircraft manufacturers in structural parts and control assemblies.

CIRCLE INFORM-A-GRAM KEY NO. 132



This bank of manifold-mounted Speed King valves controls a foundry mold flask indexing unit custom-built for a major automotive manufacturer.

to simplify piping and wiring of complex control valve installations, use...

VALVAIR'S NEW SPEED KING MANIFOLDS

Cut material and assembly labor costs on multiple control valve installations . . . use Valvair's new 2 and 3-station manifolds! Common inlet, exhaust and wiring passages, plus equally-spaced cylinder ports, eliminate unnecessary piping and wiring . . . keep installations neat. Cast aluminum manifolds may be ganged for installation of any number of valves. O-rings assure leak-free connections.

Easier in-use service is another benefit! Individual pilots, valves or entire manifolds are replaceable as units to minimize machine downtime.

And, Speed King manifolds *are available for immediate delivery from stock.* Before you engineer new equipment or up-grade machines now in service, investigate the design and cost advantages of Valvair Speed King manifolds. Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio.

AA-4967

Ganged 3 station Speed King manifolds provide neat piping . . . simplify construction and maintenance of this master control console which operates a battery of automated foundry equipment.

PIPING	—1 in. NPT intake and exhaust ports, common to all stations. Pipe threads, both ends, and O-ring grooves.
PORTING	—Optional ⅜ or ½ in. NPT cylinder ports. Side and bottom outlets, flush pipe plugs.
WIRING	—1¼ in. conduit passage, with side access cover, common to all stations. Pipe threads, both ends, and O-ring grooves. Pilot leads encased in flexible conduit.
VALVES	—2 or 3 stations for single and double solenoid Speed King valves. 2, 3 and 4-way; remote-operated; speed controlled; and power-centered neutral valves may be used in any number and combination.
MOUNTING	—2 mounting legs per manifold. Kits of O-rings and through bolts, for ganging, also available.

Find your nearest representative in the Yellow Pages

Compare . . . and you'll buy

Valvair

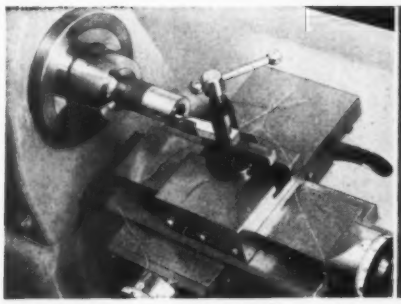
Representatives in: Baltimore • Birmingham • Boston • Buffalo • Charleston, W. Va. • Chicago Cleveland • Cranford, N. J. • Dayton • Denver • Detroit • Eureka, Calif. • Grand Rapids Houston • Indianapolis • Kansas City, Mo. • Logansport, Ind. • Los Angeles • Louisville Miami • Milwaukee • Minneapolis • Muncie • New Orleans • New York • S. Pasadena Philadelphia • Pittsburgh • Portland, Ore. • St. Louis • Seattle • San Francisco • Syracuse Montreal • Toronto • Vancouver

CIRCLE INFORM-A-GRAM KEY NO. 133

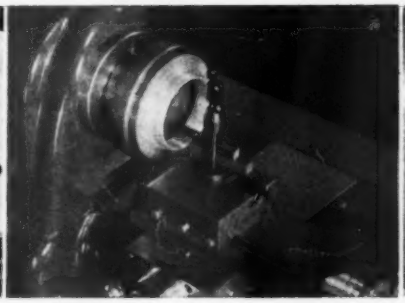
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

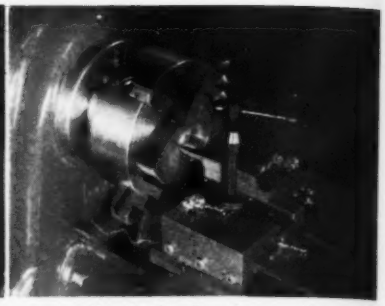
Correct Size - High Speed - Precision Results



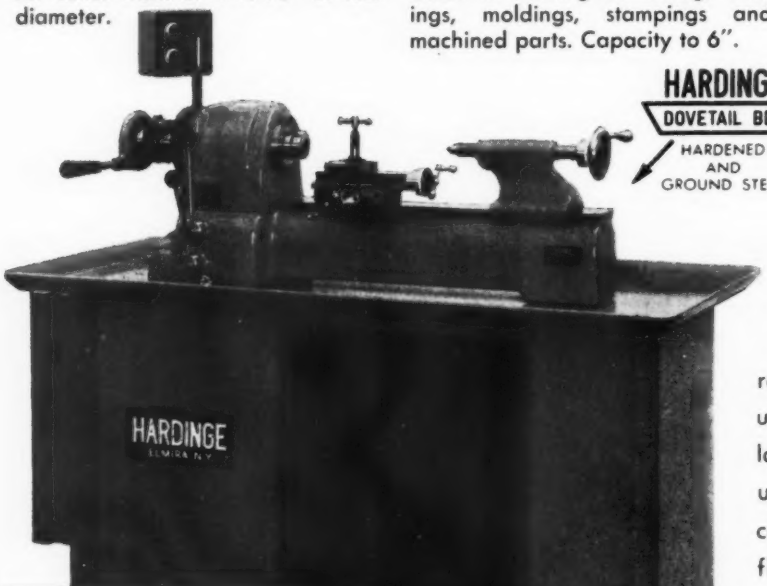
Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



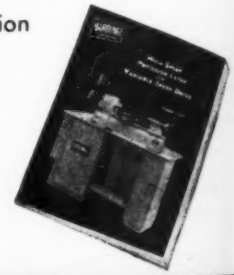
Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".



SPECIFICATIONS:
1⅛" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy. and ease of operation assure precision results



OFFICES IN PRINCIPAL CITIES.
Export Office: 269 Lafayette St., New York 12, N. Y.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

CIRCLE INFORM-A-GRAM KEY NO. 134

Presenting . . .
Representing . . .

E. W. Strohbehn of Rock Island, Ill., is representing Roll Formed Products Co. in Iowa and central western Illinois. The company's representative in Wisconsin, Minnesota, and the upper peninsula of Michigan is Mielke & Bemm, Inc., located in Milwaukee.

◆

Verson Allsteel Press Co. has named Joseph E. Rush Co. as its St. Louis area dealer. Headquarters for the new industrial machinery dealer is located in St. Louis, Mo.

◆

F. H. Ross Co. of Charlotte, N. C., has been appointed distributor for the metal processing products of Pennsylvania Salt Mfg. Co. Ross will cover North and South Carolina, Tennessee, Georgia, Mississippi, Alabama, and Florida.

◆

Allied Carbide Products Inc., Hatboro, Pa., has been named an authorized Carboloy cemented carbide die products agent by the Metallurgical Products Department of General Electric Co. Allied Products will stock all standard carbide dies and mandrels used by wire, bar and tube manufacturers.

◆

A. W. Cash Co. and its subsidiary, Cash Standard Stacon Corp., have disclosed the appointment of K. C. Brown Co. of Kansas City, Mo., as their representative in Kansas and western Missouri.

◆

Fenton Liffick has taken over as sales representative in the midwestern sales territory of Mac Dermid Inc. He is concentrating on sales of the company's line of metal cleaning, plating and finishing chemicals and compounds in Iowa, Wisconsin, Minnesota, and northern Chicago.

◆

Standard Gage Company, Inc., has made known the appointment of E. S. Phillips & Company as representatives. The Phillips Company will offer the complete line of Standard indicating, fixed and adjustable limit gages in western Pennsylvania and West Virginia.

◆

Five representatives in the North Atlantic Coast area have been chosen by the Air Gage Division of Dearborn Gage Company to sell the Dearbornaire column-type air gage instruments and air gage elements and accessories. They include A. S. Childs, Nickson Tool Sales Company, C. E. Etzler Company, Brownie Jalbert, and John Clough.

What is your swaging I.Q.?

Are you aware of the new techniques and equipment that are making rotary swaging increasingly important as a basic precision production process? Test your knowledge of modern rotary swaging with this TRUE or FALSE quiz.

SWAGING is economical—no chips, no scrap . . .

SWAGING produces work accurate within ± .001" . . .

SWAGING improves physical characteristics . . .

SWAGING can produce inside contours . . .

SWAGING can be automatic or semi-automatic and does not require skilled labor for operation . . .

FENN is one of the largest manufacturers of a complete size range of swaging equipment . . .

FENN swaging equipment swages tubing up to 6¼" diameter and solid bar stock from pinpoint to 3¾" diameter . . .

If you answered TRUE to all the questions, your knowledge is excellent. If not, you should have more information on modern rotary swaging.

In either case, it will pay you to get a copy of the new Fenn Swaging Catalog No. SM56. Write today!

FENN ROTARY *Swaging Machines*

THE FENN MANUFACTURING COMPANY, 201 Fenn Road, Newington, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 135

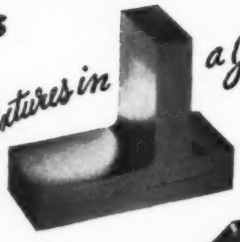
NOBLE & STANTON *Standards* FINEST QUALITY

JIG and FIXTURE COMPONENTS

Complete Line—Over 500 Parts

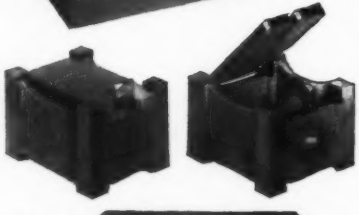
"T" ANGLE PLATES

Fixtures in a Jiffy!



Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized and precision machine castings. Full scale sheets of 7 standard sizes will be included with your catalog if requested.

BOX JIGS

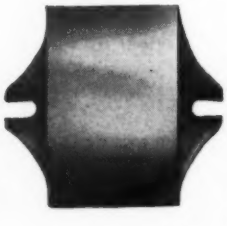


Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

MILL FIXTURE BASES

The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.

Sure Lock Fixture Keys See Page 41 of our Template Catalog



WRITE FOR FREE CATALOG

Our complete line of highest quality jig and fixture parts is shown in our new catalog. They are stocked for quick delivery from Dealers coast-to-coast. Write for your copy today!

STANDARD PARTS CO.
MANUFACTURERS OF GENUINE NOBLE & STANTON PARTS
1002 BROADWAY • BEDFORD, OHIO • BEDFORD 2-2800

CIRCLE INFORM-A-GRAM KEY NO. 1361

SPECIAL PRECISION PARTS

IN QUANTITIES—AT REASONABLE PRICES

Do you need special interchangeable tool parts, precision-made to your specifications, in quantities from 6 to 100 pieces or more? The automotive and aircraft industries have used us for years for this type of work. At present a number of large automated plants depend upon us for special, precision-made parts at reasonable prices.

We are especially qualified to meet your automation parts requirements. Our prices, quality and delivery will more than please you. Send your prints for prompt quotations.

STANDARD PARTS CO.
1002 BROADWAY • BEDFORD, OHIO

FOR FAST ACTION — Phone: BEdford 2-2800

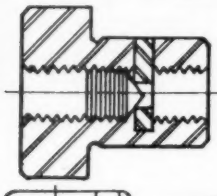
CIRCLE INFORM-A-GRAM KEY NO. 1362

NOBLE & STANTON
Standard
JIG & FIXTURE COMPONENTS

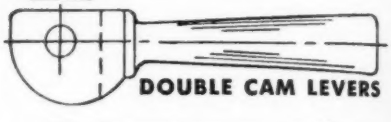
Just a Few of the Many

NEW ITEMS

in our Line of 500 Components

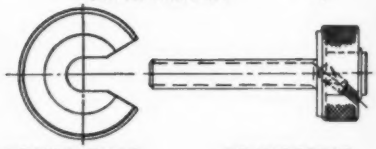


SURE LOCK FIXTURE KEYS



DOUBLE CAM LEVERS

FLAT NOSE HEEL CLAMPS
Soft for Alteration



EQUALIZING "C" WASHERS

ADJUSTABLE TORQUE SCREWS

FINEST QUALITY STANDARDS For Your Tooling Program

Hundreds of time-saving, money-saving components shown in our

NEW CATALOG
66 PAGES
FREE!

Write for your copy!
Tracing sheets available for every part

STANDARD PARTS CO.
1002 BROADWAY • BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1363

INFORM-A-GRAM MARCH 1957 ISSUE

DO NOT USE THIS CARD AFTER MAY 31, 1957

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

2	21	40	61	119	140	167	205	1572	1654	1755	1871	1954	2072	2152	2205
3	22	41	62	120	141	168	206	1573	1661	1756	1872	1961	2073	2153	2211
4	23	43	63	122	142	171	209	1581	1662	1761	1873	1962	2074	2154	2212
5	24	44	64	123	143	174	214	1582	1663	1762	1881	1963	2075	2155	2213
7	25	45	65	124	144	177	225	1583	1664	1763	1882	1991	2081	2171	2214
8	26	46	68	125	145	178	226	1584	1665	1764	1883	1992	2082	2172	2231
9	27	47	69	126	147	181	1361	1585	1666	1791	1911	1993	2083	2173	2232
10	28	48	70	127	148	182	1362	1586	1691	1792	1912	2001	2084	2174	
11	29	49	71	128	149	185	1363	1611	1692	1793	1913	2002	2101	2175	
12	30	50	72	129	150	186	1521	1612	1693	1801	1914	2003	2102	2181	
13	31	51	105	131	151	189	1522	1613	1701	1802	1915	2004	2103	2182	
14	32	52	107	132	153	190	1523	1614	1702	1803	1916	2031	2111	2183	
15	33	53	108	133	155	193	1524	1621	1703	1831	1917	2032	2112	2191	
16	34	55	109	134	156	194	1525	1622	1704	1832	1921	2033	2113	2192	
19	35	56	112	135	159	197	1541	1623	1751	1833	1922	2041	2131	2201	
18	36	57	115	137	160	198	1542	1651	1752	1841	1951	2042	2132	2202	
19	37	59	116	138	163	201	1543	1652	1753	1842	1952	2043	2133	2203	
20	38	60	117	139	164	202	1571	1653	1754	1843	1953	2071	2151	2204	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	A91	B18	B36	B54	C2	E2	F7
A2	A20	A38	A56	A74	B1	B19	B37	B55	C3	E3	F8
A3	A21	A39	A57	A75	B2	B20	B38	B56	C4	E4	F9
A4	A22	A40	A58	A76	B3	B21	B39	B57	C5	E5	F10
A5	A23	A41	A59	A77	B4	B22	B40	B58	C6	E6	F11
A6	A24	A42	A60	A78	B5	B23	B41	B59	C7	E7	F12
A7	A25	A43	A61	A79	B6	B24	B42	B60	C8	E8	F13
A8	A26	A44	A62	A80	B7	B25	B43	B61	C9	E9	
A9	A27	A45	A63	A81	B8	B26	B44	B62	C10	E10	
A10	A28	A46	A64	A82	B9	B27	B45	B63	C11	E11	
A11	A29	A47	A65	A83	B10	B28	B46	B64	C12	E12	
A12	A30	A48	A66	A84	B11	B29	B47	B65	C13	E13	
A13	A31	A49	A67	A85	B12	B30	B48	B66	C14	F1	
A14	A32	A50	A68	A86	B13	B31	B49	B67	C15	F2	
A15	A33	A51	A69	A87	B14	B32	B50	B68	C16	F3	
A16	A34	A52	A70	A88	B15	B33	B51	B69	C17	F4	
A17	A35	A53	A71	A89	B16	B34	B52	B70	C18	F5	
A18	A36	A54	A72	A90	B17	B35	B53	C1	E1	F6	

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

INFORM-A-GRAM MARCH 1957 ISSUE

DO NOT USE THIS CARD AFTER MAY 31, 1957

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

2	21	40	61	119	140	167	205	1572	1654	1755	1871	1954	2072	2152	2205
3	22	41	62	120	141	168	206	1573	1661	1756	1872	1961	2073	2153	2211
4	23	43	63	122	142	171	209	1581	1662	1761	1873	1962	2074	2154	2212
5	24	44	64	123	143	174	214	1582	1663	1762	1881	1963	2075	2155	2213
7	25	45	65	124	144	177	225	1583	1664	1763	1882	1991	2081	2171	2214
8	26	46	68	125	145	178	226	1584	1665	1764	1883	1992	2082	2172	2231
9	27	47	69	126	147	181	1361	1585	1666	1791	1911	1993	2083	2173	2232
10	28	48	70	127	148	182	1362	1586	1691	1792	1912	2001	2084	2174	
11	29	49	71	128	149	185	1363	1611	1692	1793	1913	2002	2101	2175	
12	30	50	72	129	150	186	1521	1612	1693	1801	1914	2003	2102	2181	
13	31	51	105	131	151	189	1522	1613	1701	1802	1915	2004	2103	2182	
14	32	52	107	132	153	190	1523	1614	1702	1803	1916	2031	2111	2183	
15	33	53	108	133	155	193	1524	1621	1703	1831	1917	2032	2112	2191	
16	34	55	109	134	156	194	1525	1622	1704	1832	1921	2033	2113	2192	
19	35	56	112	135	159	197	1541	1623	1751	1833	1922	2041	2131	2201	
18	36	57	115	137	160	198	1542	1651	1752	1841	1951	2042	2132	2202	
19	37	59	116	138	163	201	1543	1652	1753	1842	1952	2043	2133	2203	
20	38	60	117	139	164	202	1571	1653	1754	1843	1953	2071	2151	2204	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	A91	B18	B36	B54	C2	E2	F7
A2	A20	A38	A56	A74	B1	B19	B37	B55	C3	E3	F8
A3	A21	A39	A57	A75	B2	B20	B38	B56	C4	E4	F9
A4	A22	A40	A58	A76	B3	B21	B39	B57	C5	E5	F10
A5	A23	A41	A59	A77	B4	B22	B40	B58	C6	E6	F11
A6	A24	A42	A60	A78	B5	B23	B41	B59	C7	E7	F12
A7	A25	A43	A61	A79	B6	B24	B42	B60	C8	E8	F13
A8	A26	A44	A62	A80	B7	B25	B43	B61	C9	E9	
A9	A27	A45	A63	A81	B8	B26	B44	B62	C10	E10	
A10	A28	A46	A64	A82	B9	B27	B45	B63	C11	E11	
A11	A29	A47	A65	A83	B10	B28	B46	B64	C12	E12	
A12	A30	A48	A66	A84	B11	B29	B47	B65	C13	E13	
A13	A31	A49	A67	A85	B12	B30	B48	B66	C14	F1	
A14	A32	A50	A68	A86	B13	B31	B49	B67	C15	F2	
A15	A33	A51	A69	A87	B14	B32	B50	B68	C16	F3	
A16	A34	A52	A70	A88	B15	B33	B51	B69	C17	F4	
A17	A35	A53	A71	A89	B16	B34	B52	B70	C18	F5	
A18	A36	A54	A72	A90	B17	B35	B53	C1	E1	F6	

Which article in this issue was of most interest to you? _____

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in the United States

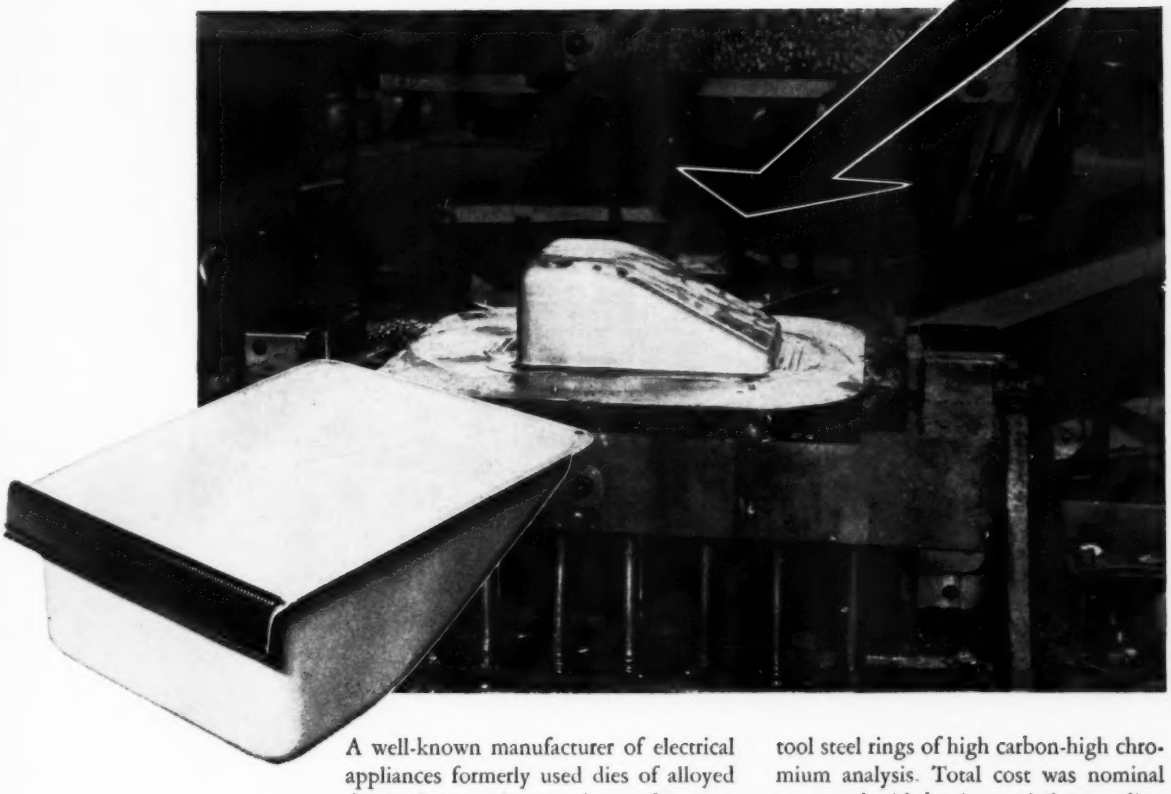
4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

Here's how A-L CAST-TO-SHAPE TOOL STEELS solved a serious scrap problem on this job



A well-known manufacturer of electrical appliances formerly used dies of alloyed ductile iron castings to draw refrigerator crisper pans.

These dies had to be redressed after every 10,000 pieces (approximate cost: $1300 each) and had to be replaced after every 30,000 pieces. 8 to 10% of the pans were scrapped due to defects.

Because of this scrap problem and the severity of the draw—a 52% reduction of the steel—it was decided to rebuild the dies using a suitable grade of tool steel.

A 2″ cut was taken off the top of the old cavity and the draw ring. These cuts were replaced with A-L Cast-to-Shape tool steel rings of high carbon-high chromium analysis. Total cost was nominal compared with buying entirely new dies.

Each of the revised dies has produced approximately 500,000 pans. Their condition indicates that probably *twice* that many can be drawn before the dies must be redressed. Defective pieces have been reduced to a mere 1½ to 2%—*an 80% reduction!*

● Ask your A-L representative TODAY how Cast-to-Shape tool steel can help solve your production problems . . . or write ***Allegheny Ludlum Steel Corporation, Forging and Casting Division, Detroit 20, Mich.***

SEND FOR THIS NEW CATALOG

"FORGING AND CASTING PRODUCTS"

Contains the latest information on FCC Air Hardening, Oil Hardening and other Cast-to-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections and Smooth Hammered Forgings in a wide range of tool and stainless steels. *Get your copy NOW*

ADDRESS DEPT. TP-87

For complete **MODERN** Tooling, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

WSW 6123

CIRCLE INFORM-A-GRAM KEY NO. 137

NOW Flame hardened bed ways ... STANDARD EQUIPMENT at NO EXTRA COST!

6319 ILLUSTRATED, 1" COLLET CAPACITY. AVAILABLE WITH VARIABLE SPEED DRIVE.

ON ALL MODELS OF

CLAUSING 12" LATHES

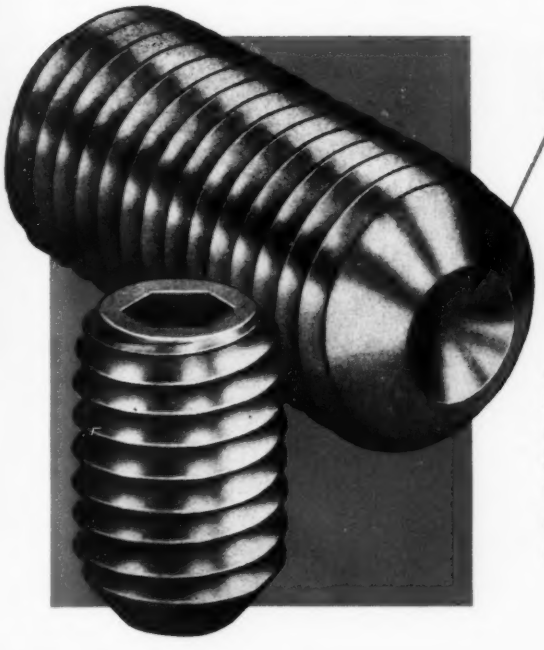
With the introduction of flame hardened bed ways as standard equipment at *no extra cost*, another important exclusive feature has been added to the long list of *Plus Values* that make the Clausing 12" Lathes outstanding in their price field. Write for illustrated literature, and also literature on the new variable speed drive and 12" Hydraulic Tracer Lathe.

Atlas CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY KALAMAZOO MICHIGAN U.S.A.

CLAUSING DIVISION ATLAS PRESS COMPANY

3-115 N. PITCHER ST., KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 138



ALLENPOINT will give you a bulldog grip at no premium in price!

Allen's scientific redesign of the cup diameter on set screws gives greatly increased resistance to *withdrawal* torque. You can count on Allenpoint Set Screws to stay tighter longer, under heavy strain and vibrations. This dependable premium performance of Allenpoints is yours to use without increasing the cost of manufacturing your products.

Uniform Class 3A Threads

Allenpoints' smooth, uniform threads prevent off-lead conditions like Fig. 1. With Allenpoints, you have full, even contact between the engaging flanks of the threaded members (Fig. 2) –and a tight friction lock over the entire length of the Allenpoint Set Screw.

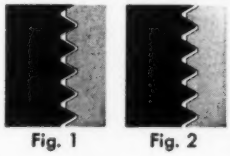


Fig. 1 Fig. 2

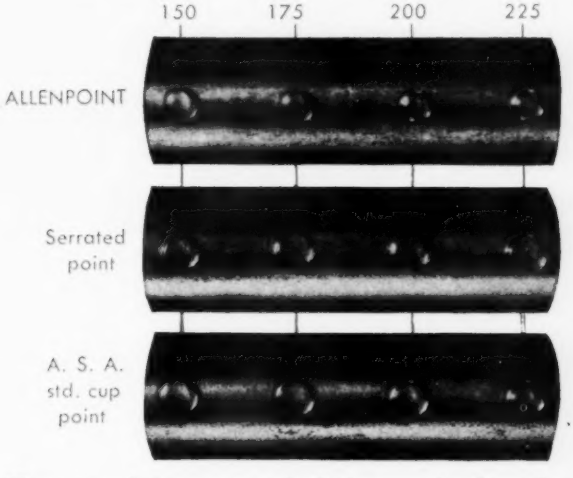
Strong, clean, deep sockets allow full wrenching leverage

Sockets of Allenpoint Set Screws are cold forged to produce a deeper, smoother socket. No broach chips to interfere with proper seating of the key. This "pressur-forming" preserves the long steel fibers throughout the length of the screw—stronger walls allow maximum tightening torque.

One more full thread on ALLENPOINTS!

Allenpoint Set Screws have one more full thread than serrated point set screws. That means more holding power—especially important when you're using short lengths.

ALLENPOINT's performance compared for you



These actual-size, unretouched photographs show the cup pattern made by Allenpoints, serrated points, and A.S.A. standard cup point set screws in a 3/4" steel shaft. At each degree of tightening force, Allenpoints make a full circle pattern, penetrating deeper for greater holding power.

We'll be glad to send you more information and samples of Allenpoint Set Screws and other Allen Socket Screw products.

Stocked and sold by leading industrial distributors everywhere

ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

ALLEN HEAD HEX-SOCKET SCREWS

CIRCLE INFORM-A-GRAM KEY NO. 139

BLISS HIGH PRODUCTION PRESSES "do-it-themselves" at Black and Decker

Just three Bliss High Production Presses produce the millions of motor laminations Black and Decker uses in its complete line of more than 150 portable power tools!

Running in the upper speed range, sometimes at well above 250 strokes per minute, through two shifts a day—and occasionally three. And they've been doing it for a long time now with no problems.

Of course, H-P presses are built for speed. Extra heavy cast Meehanite frame • *Square* gibbing • Automatic lubrication • Variable speed drive • Special air friction clutch • Counterbalanced crankshaft. Every feature has been especially designed to maintain precision at top speeds. That adds up to top production rates, longer die life.

Another plus, users tell us, is the wide open die area that makes quick set-up and changeover possible. In fact, the fast set-up makes *short-run* work practical with Bliss H-P Presses. And the room *under* the press is a handy place to run chutes or store tote boxes.

If production of short-stroke stamped parts is your problem, long run or short, you'll want to learn more about Bliss H-P presses. Our recently revised 32-page catalog No. 27-C describes the entire line and gives examples of the wide range of work you can accomplish with these presses. Why not write for a copy today.

BLISS SINCE 1857

is more than a name... it's a guarantee

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, California; *Branch Offices* in Boston, Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. *Other representatives throughout the world.*

E. W. BLISS COMPANY, CANTON, OHIO • Presses, Rolling Mills, Rolls, Special Machinery

CIRCLE INFORM-A-GRAM KEY NO. 140

ACCURACY WITHIN 5 THOUSANDTHS OF AN INCH . . . OVER 14,400 SQUARE INCHES!

An example of a precision surface need met by CHALLENGE EQUIPMENT.

The American Seating Company of Grand Rapids, Michigan, needed a precision surface 50 feet in length, accurate within 5 thousandths of an inch over the entire area, on which to inspect the aircraft wing spars and aluminum castings they are producing for a large aircraft manufacturer.

The answer was easy! Challenge supplied five of their standard Sectional Assembly Layout Surface Plates each 10 feet in length. When keyed and bolted together, these "exclusive" Challenge units, each accurate within .002", provide an overall accuracy of .005 of an inch. Another advantage for American Seating is the flexibility of these units! If the production needs change, the sections can be taken apart and used separately, or new sections can be added as needed.

This is just one example of how Challenge has helped many manufacturers solve their precision surface requirements. Challenge has the broadest line of precision surface equipment and Challenge factory specialists are available to work with you on your needs. So, if you have an inspection, assembly or manufacturing problem involving precision surfaces, **check first with Challenge.**

Write Challenge,
for a complete Catalog of Challenge Standard Precision Surface Equipment — including Semi-Steel and Granite Surface Plates, Semi-Steel V-Blocks, Angle Plates, Floor Plates, etc....

Available through local mill supply distributors.

SE-107

Challenge®

TP-3

THE CHALLENGE MACHINERY COMPANY
GRAND HAVEN, MICHIGAN

Please send me your free catalog — 838W
of Challenge Precision Surface Equipment.

Name_____ Position_____
Company_____
Address_____
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 141

New Style KSDN Kendex Tool designed for turning, profiling and chamfering in either direction

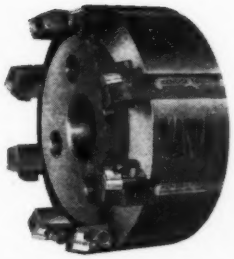
KENDEX* turnover "throw-away" principle adaptable to many special cutting jobs

Quick, accurate indexing . . . fast tool changes . . . *no* costly grinding . . . all of which add up to higher production with lower tool investment and minimum maintenance costs.

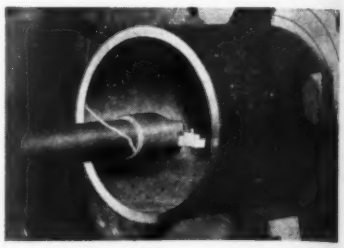
These are the Kendex advantages that have resulted in adaptation of Kendex to many *special* job applications; odd job milling, step milling, face milling, and boring, chamfering, turning, and profiling operations. A few adaptations of the Kendex design principle to varied cutting problems are illustrated.

But, no matter if it's a special or a standard machining operation, Kendex Tooling provides many distinct advantages. In addition to quick, accurate indexing, without resetting the toolholder, and the elimination of all grinding, Kennametal* "throw-away" button inserts reduce machine down time and speed up production.

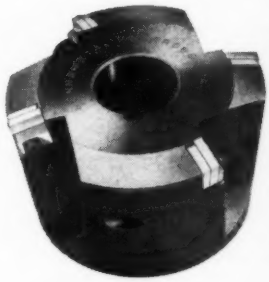
Why not let a Kennametal tool engineer help you select the right Kendex Tooling for each job . . . special or standard. By training and experience, he is qualified to analyze tooling problems and recommend right solutions. Or write KENNAMETAL INC., Latrobe, Pennsylvania.



Eight standard Kendex Tools adapted to odd job milling



Boring bar equipped with standard Kendex Tooling



Special 4-step boring head with adaptation of standard Kendex "throw-away" inserts and clamp mechanism

Kendex Boring Bar uses Kennametal "throw-away" inserts and Kennametal chip breakers.

*Trademark

MINING, METAL AND WOODWORKING TOOLS
WEAR AND HEAT-RESISTANT PARTS
INDUSTRY AND KENNAMETAL ...Partners in Progress
ABRASION, CORROSION-RESISTANT PARTS
PERCUSSION AND IMPACT PARTS
CIRCLE INFORM-A-GRAM KEY NO. 142

THEY'RE BOTH TWO DIAMETER DRILLS . . .

BUT WHICH ONE SHOULD YOU USE?

STEP TOOLS VS. SUBLANDS

Manufacturing Accuracy:
Subland tools are turned, machined, ground and faced—all operations between centers for ultimate accuracy. Step tools are chucked in single collet and ground to approximate desired size.

Maintenance:
Sublands tools incorporate separate lands for each diameter—thus they can be accurately resharpened many times. Step tools must be remade during sharpening procedure—losing concentricity and continually weakening tool.

Performance:
Subland tools are built right to work right. They perform their precision operations flawlessly because they are accurately designed. They cost slightly more than standard tools—but they outlast them many times.

Results:
Tool test reports prove conclusively that Sublands out-perform standard or step type tools on practically all continuous, multiple drilling operations.

Versatility:
Subland tools can be made to accurately and dependably perform any practical number of operations—simultaneously! Accordingly, they pay for themselves in time, tools and equipment.

A MOHAWK SUBLAND . . . *NATURALLY!*

Mohawk Subland Drills are the modern answer toward faster, more accurate, economical combination tooling operations plus amazing production saving.

Why stock heavy inventory of widely varied step type tools for consecutive drilling operations? One pass with a Mohawk Subland Drill will do the work of two, three, four—or more—*ordinary* drills because Sublands last longer . . . stay accurate through multiple regrinds . . . and reduce hole costs.

A Mohawk Subland is the one versatile tool that will quickly pay for itself in man hours, equipment and tool dollars. They're immediately available in an amazing range of "Off-the-Shelf" Size-Optional sizes and types for every conceivable drilling combination. Highly specialized types are also readily available.

Write . . . Wire . . . Phone . . .

today for your Mohawk Subland Tool Catalog and/or the new brochure on Sublands vs. Step Tool operations. They're yours for the asking . . . and if you are interested in combination drilling operations, you'll find dozens of ways to save your equipment dollars.

NORMAL DELIVERY ON MOHAWK SIZE-OPTIONAL SUBLANDS—ONE WEEK FROM RECEIPT OF ORDER!

world's largest producers of Sublands

MOHAWK TOOLS, Inc.
Montpelier, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 143

UDDEHOLM Swedish Strip Steel

Quality Uddeholm definitely *sells* quality, *extra* quality —and you can expect it. In fact, in the important features of uniformity, flatness, finish, tolerance accuracy, and edge straightness, you'll get even more than you've come to expect.

Performance New customers are consistently surprised, and pleased, with Uddeholm Strip Steel performance—especially when they see it transferred to *their* product. Old customers now take it for granted. It shows up in longer product life, greater fatigue resistance, excellent spring quality, and surfaces free from all defects.

Variety Uddeholm has a wide selection of grades, sizes, tolerances and finishes—in combinations to answer your most exacting needs. Widths range from ⅛″ to 16¼″, thicknesses from .001″ to .125″. Tolerances are possible to ±.00008″. Finishes are bright, scaleless blue, straw polished and blue polished. Slitting and edging facilities are also available.

Large Stocks Abundant supplies are always on hand for almost any application: band saws (metal, wood and butcher), clock springs (flat and coil), intricate machine parts, flapper and flutter valves, Stainless Steel products, shock absorbers, razor blades, feeler gages, reeds, knives, and countless others.

Delivery In a hurry? Say so. Uddeholm is always ready to accommodate "rush" orders.

Write for latest Strip Steel Stock List

UHB

UDDEHOLM COMPANY OF AMERICA, INC.

Tool and Die Steels
Specialty Strip Steels

Offices and Warehouses

New York: 155 East 44th Street, MUrray Hill 7-4575
Cleveland: 4540 East 71st Street, DIamond 1-1110
Los Angeles: 5037 Telegraph Road, ANgelus 2-5121

District Representatives

CHICAGO Frank J. Mackin, Leroy E. Marshall, 55 East Washington, STate 2-1649 DETROIT: Warren H. Nugent, 17304 Lahser Road, KEnwood 5-6340
PHILADELPHIA: Frank T. Campagna, 34 South 17th Street, RIttenhouse 6-4290

CIRCLE INFORM-A-GRAM KEY NO. 144

NEW ROTOR "117" series Small-Wheel Air Grinders

Check these features:

Governed for top production. Runs at best practical working speed for *maximum power.* Available in 17,000, 12,000 or 8,000 rpm.

Quiet. Designed for quiet operation.

Wide selection. You can select from over 150 different combinations of speeds, spindles and throttles to do *your* job.

Ask the Rotor Application Engineer for a demonstration on your job. Bulletin 59 free on request. The ROTOR TOOL Company, Cleveland 32, Ohio.

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 145

MEN YOU SHOULD KNOW

Roy W. Bailey has become president and treasurer of Detroit Power Screwdriver Co., according to an announcement by the company. Disclosed at the same time was the election of **Robert F. Gladfelter** as vice president of sales, and secretary, and **John M. Small** as vice president in charge of manufacturing.

◆

Kaiser Aluminum & Chemical Corp. has named **William B. Thomas** as manager of its newly acquired extrusion plant at Dolton, Ill.

◆

Five vice presidents elected by The Carborundum Co. are **Niles C. Bartholomew, Gene DeMambro, I. Wendell Hamm, Joseph S. Imirie** and **Leslie E. Simon.** Filling the new position of assistant to the president on international activities is **A. Francis Politi. George E. McGuire** has been promoted to assistant vice president, acting as a consultant to the president on export sales and international activities. **William H. Wendell** has been elected group vice president. **Semon Stupakoff** has taken over as vice president of the company and **Robert Barr** has been promoted to general manager of the Stupakoff Division, succeeding Mr. Stupakoff.

The new president and general manager of Eclipse Counterbore Co. is **Herbert R. White. Roy G. Mitchell** has been elected chairman of the board of directors; **I. A. Homrich,** vice president in charge of manufacturing; and **Austin P. Smith,** vice president in charge of engineering.

◆

John F. Hinchey has been appointed manager of the Quality Assurance Department of the Electro-Data Division of Burroughs Corp. He will direct the testing, inspection, and quality control of Datatron high-speed electronic data processing systems during the entire manufacturing operation.

◆

Harold Ames, Jr., has become president of Electro-Snap Switch & Mfg. Co.

◆

A. I. Nussbaum has joined Loma Machine Mfg. Co., Inc., taking charge of the Rolling Mill Division.

◆

Advancement of **Clayton E. Scott** to the post of manager of the Six Mile Road plant of Michigan Tool Co. has been disclosed. **Richard S. Hildreth** has been appointed to succeed Mr. Scott as chief engineer of the Machine Tool and Cutting Tool Division.

Tadeusz Sendzimir has been elected to the board of directors of The Waterbury Farrel Foundry & Machine Co.

◆

Appointment of **Donald S. Holmes** as quality control engineer-applied research and development has been announced by General Electric Co. He will assist the company's operating components in establishing and maintaining a modern quality control function. Two new motor departments have been formed with **O. F. Vea** as general manager of the Medium A-C Department and **Bryce W. Wyman** serving as general manager of the Small A-C Department.

◆

John Moxon has been advanced to the new office of executive vice president by The Carpenter Steel Co. **Dr. Carl B. Post** was elected to the board of directors.

◆

Stanley Adamek has taken over as manager of manufacturing for Pheoll Mfg. Co.

◆

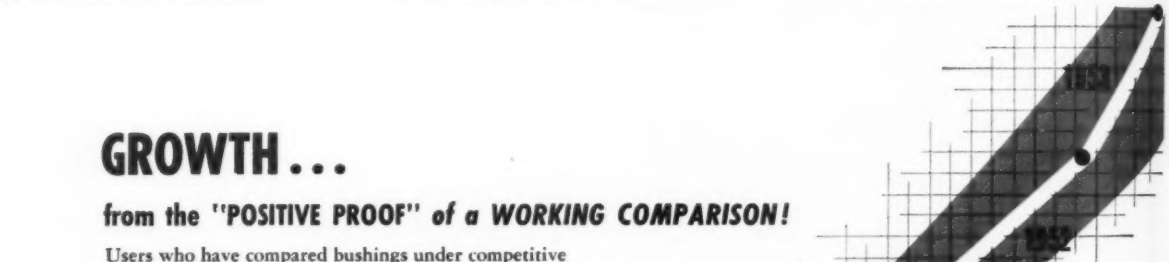
The new general manager of The Progressive Mfg. Co., division of The Torrington Co., is **Warren F. Bice.** He succeeds **Ralph H. Perry** who has retired.

GROWTH . . .

from the "POSITIVE PROOF" *of a WORKING COMPARISON!*

Users who have compared bushings under competitive working conditions are the real factors behind ACE's sensational Growth! See this "Positive Proof" yourself . . . just choose *any* ACE drill bushing — work it side-by-side with *any other make* — in *your own* shop — under *your own* specific working conditions. You'll see actual "proof" that ACE's high carbon chromium bearing steel gives much longer life through superior quality.
Twice the Life Means Half the Cost!

MAMMOTH STOCKS immediately available from scores of *ACE DISTRIBUTORS* . . . in all key industrial areas in the U.S., Canada and in foreign countries.



From a wee little fella in 1947 . . .

. . . to one of the BIGGEST in 1956!

10 years of SPECTACULAR GROWTH
IS THE RESULT OF
Superior Quality & Service

Always Specify ACE

DRILL BUSHINGS

Write today for your free copy of the all new 1957 ACE CATALOG . . . with both finished and unground list prices, technical data and name of your nearest dealer . . . ALL ON ONE COMPREHENSIVE, EASY-TO-READ SPREAD. No pages to turn, no information to hunt!

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 147

MEN YOU SHOULD KNOW

S. Lee Elliott has joined the Metallurgical Products Department of General Electric Co. as an equipment development engineer. His new duties include the development of machines and equipment for the manufacture of cemented carbides.

◆

Three executives have been appointed to the new position of group vice president and to the management organization of the Basic Manufacturing Divisions of Ford Motor Co. They are **Ray H. Sullivan, John Dykstra** and **Irving A. Duffy. A. J. Hole** has been named group executive-metal stamping. **C. H. Paterson** has been appointed group executive-engine and foundry. Seven other new division general managers are **J. B. Lawson,** Automatic Transmission Division; **R. H. Ponta,** Engine Division; **F. X. Bujold,** Foundry Division; **A. C. Haines,** Frame — Tool and Die Division; **S. S. Wilson,** Stamping Division; **W. F. Mueller,** Hardware Division; and **P. A. Miller,** Accessory Division.

◆

Magnaflux Corp. has announced the promotion of **Roy O. Schiebel** to the position of second vice president-sales and marketing.

R. J. Longpre has joined the general manager's staff of Pontiac Motor Division of General Motors Corp. He will be responsible for general material control, parts warehouse operations, central stores and traffic.

◆

The newly created position of general manager of the Campbell Machine Division of American Chain & Cable Co. is being filled by **Hugh V. Allison,** who is also president and general manager of the Allison Division. Mr. Allison will guide the development of both cutting wheels and cutting equipment.

◆

The new factory manager of The Fellows Gear Shaper Co. is **Wallace H. Dodge.** He succeeds **H. T. Gates** who has retired after 37 years with the company. **John E. Angell** has been appointed factory controller, succeeding **Charles H. Winkler.**

◆

The appointment of **Steven S. Gordon** as assistant general manager of Republic Gear Co. has been announced by **Edgar D. Leon,** president of Gear Grinding Machine Co., the parent company.

The election of **Henry M. Haase** as president and chief executive officer of the York Division of Borg-Warner Corp. has been announced. He will continue to be a vice president of the company. The elevation of **Stewart E. Lauer** to the chairmanship of the board of the York Division has also been disclosed.

◆

The election of **Carl F. Herbold** and **Ralph J. Eschborn** as vice presidents of Jack & Heintz, Inc. has been disclosed. Mr. Herbold will direct the company's manufacturing operations, with responsibility also for industrial relations. Mr. Eschborn will be in charge of all engineering activities.

◆

Erwin J. Kaiser has been named staff vice president-manufacturing of Giddings & Lewis Machine Tool Co. Succeeding him as general manager of the Davis Boring Tool Division is **George K. Cassady.** Taking over as sales manager of the company's G&L and Hypro Division is **Guy E. Lingenfelter.**

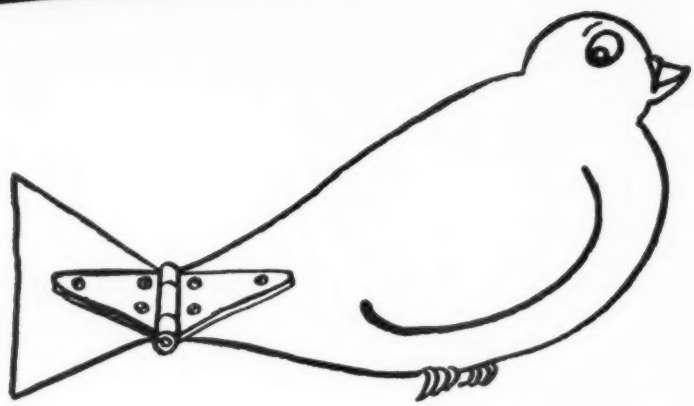
◆

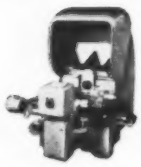
Kennametal Inc. has announced the appointment of **B. Clark Boeckeler** as assistant for advanced planning and development.

DROODLES

by ROGER PRICE

J&L





Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

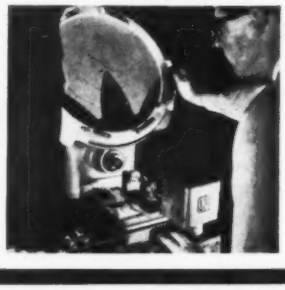
Table Model TC-14
(Vertical Inspection)

"DOVETAIL JOINT"

Several years ago, when I first made my mark as a demon bird-watcher, I had a nice little organization going in the upper Bronx, known as "The Feathered Friends". My pal, Speedy Bledsoe, was Pres., I was Treas., and we had 47 dues-paying members. When we split up the city for watching assignments, Speedy and I took 3rd Avenue, near Wally's Place, where he and I held our Executive Sessions. Some of our dopey club members got all churned up when they found out. At the next meeting, they voted a bonus for me and Speedy, consisting of a bucket of hot tar each. Needless to say, they threw in some feathers for good measure.

Speaking of good measure reminds me of the Jones & Lamson Optical Comparator. This is a precisely engineered instrument that is used throughout industry for measuring and inspecting all sorts of parts and objects of various sizes and shapes. It is speedy and accurate (to .0001") and reduces inspection costs to a minimum. The J & L Comparator is extremely versatile, making it equally suitable for both production-line and job-shop work. You'll find it enables you to perform inspections that just aren't possible by any other method. Get the full details . . . point a carrier pigeon Vermont-ward and send this coupon *today!*

JONES & LAMSON OPTICAL COMPARATORS *On the Job . . .*



Involute forms, analyzed for Production Control

J & L's new method not only inspects but also analyzes the form, position, spacing and other aspects of involute gears and splines. This system provides the necessary information for correction or adjustment in the manufacturing process by which these involute forms are generated. *A single master chart covers a wide range of sizes.* WRITE FOR OUR ENGINEERING STUDY, "OPTICAL ANALYSIS OF GEARS AND SPLINES".

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

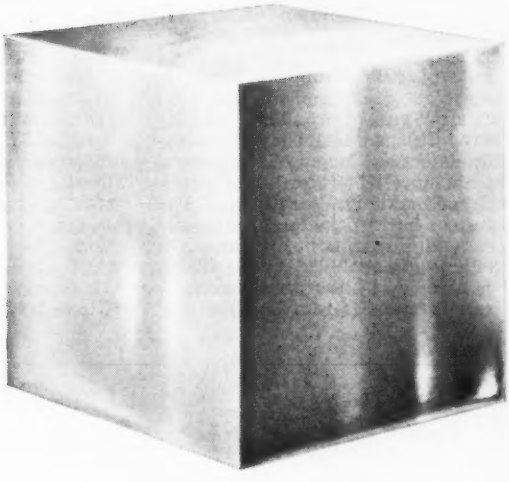
JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name _____ title _____ street _____

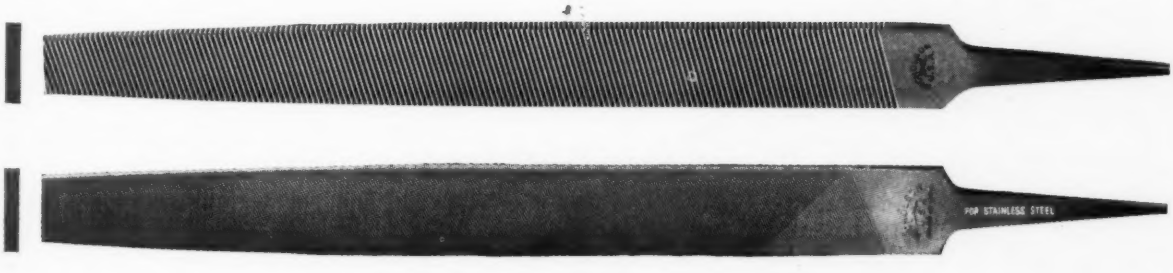
company _____ city _____ zone _____ state _____

CIRCLE INFORM-A-GRAM KEY NO. 148



For soft lead...or durable stainless steel...

Nicholson makes a file for every purpose



Whether you work with soft lead or babbitt . . . or whether you have to file rugged stainless steel . . . there's a Nicholson-made file that's been designed specifically for the job at hand.

Not only do we make the world's finest files, but we make them to meet every industrial need—for the softest metals and the hardest . . . for the most delicate instruments and for those big jobs that require rapid but efficient metal removal.

You can select Machinist's files . . . Regular Purpose files and rasps . . . Special Purpose files for aluminum or plastics . . . X.F. (*EX*tra *F*ine) Swiss Pattern files in hundreds of shapes and sizes . . . over *6000* high-quality varieties.

If you work with metal, you can use Nicholson or Black Diamond files

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

BLACK DIAMOND U.S.A.

NICHOLSON FILES ***A FILE FOR EVERY PURPOSE***

CIRCLE INFORM-A-GRAM KEY NO. 149

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Industrial Balancing Machines are the subject of Form 24-1 issued by Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14. They electronically detect the location and amount of unbalance in a rotor under conditions of maximum sensitivity. The features, basic principles of operation, and descriptions of the units available are included in the literature supplied by the company, or — **Circle Inform-A-Gram No. B1.**

Maintain The Electrical Integrity of Wire in Any Environment with the Sealink permanent, water-sealed splice. This splice exceeds all immersion dielectric, voltage drop and tensile strength requirements. Installing the Sealink is a rapid, uniformly controlled and simple operation. For details and specifications, see the bulletin issued by Burndy Engineering Co., Inc., Norwalk, Conn., **Circle Inform-A-Gram No. B2.**

6 Features that make a big difference in counterboring operations!

1. HAND DETACHABLE . . . a twist of the wrist engages or releases the cutter.
4. BALANCED DRIVE . . . double lugs on the cutter engage double abutments in the holder to form a single, rugged tool.
2. RIGHT OR LEFT HAND . . . lock or release either right or left-hand cutters quickly, easily, simply.
5. FREE FROM OBSTRUCTIONS . . . slips easily into a bushing or can be threaded for stop nuts or collars or fluted to remove chips.
3. EXTRA TORSIONAL RIGIDITY . . . drive lugs are close to seating shoulder of cutter for powerful, smooth operation.
HOLDER
6. PRACTICALLY INDESTRUCTIBLE . . . no binding, no shearing—driving forces apply compression.

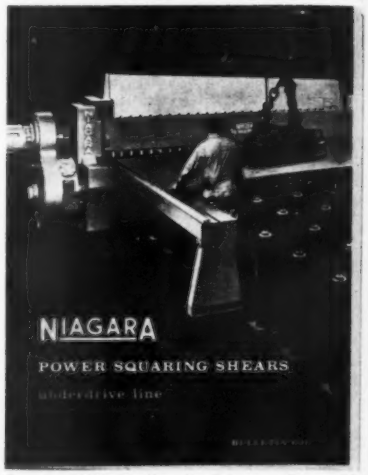
These are the features that make the difference in counterbores—six reasons why no one has ever reported failure of a Continental Counterbore Drive!

CTW Continental TOOL WORKS
Division of Ex-Cell-O Corp. • Detroit 32, Mich.

57-9

CIRCLE INFORM-A-GRAM KEY NO. 150

Underdrive Squaring Shears are covered in comprehensive Bulletin 69G from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. Described and illustrated are features such as a multi-jaw sleeve clutch, self-compensating holddown,



four cutting edge knives and a self-measuring back gage. Included are photos of job applications and specifications for each of the 59 models in the underdrive line of power squaring shears.
Circle Inform-A-Gram No. B3.

All Forms of Metal Heat Treating, continuous enameling, aluminum melting and ceramic requirements are met by large size, field-erected production furnaces. A bulletin illustrates installations of these furnaces. Also discussed are the advantages of these field-erected furnaces. For complete information, get a bulletin from Lindberg Industrial Corp., 2321 W. Hubbard St., Chicago 12, or **Circle Inform-A-Gram No. B4.**

Aluminum Hand Trucks and Dock Boards are highlighted in Bulletin VB11156-1 issued by Voltz Bros., Inc., 2573 Indiana Ave., Chicago 16. The Met-L-Ite line is lightweight, corrosion and acid-resistant, and non-magnetic. For complete details, see the bulletin issued by the company, or —
Circle Inform-A-Gram No. B5.

Machine Knives and Edge Tools are highlighted in a new catalog containing engineering data and a stock list. The various items are described and illustrated complete with regrind information. Copies of the catalog are supplied by Alcon Production Tool Co., 579 Baird St., Akron 11, O., **Circle Inform-A-Gram No. B6.**

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Rapid Change of Setup and reversible traverse are two of the features of a centerless grinding and finishing machine using abrasive belts. Type 914 is capable of heavy stock removal on bars and tubes 1" to 6" dia, and with proper fixtures, of any length and weight. Details and specifications are found in a bulletin from Production Machine Co., Greenfield, Mass., or —
Circle Inform-A-Gram No. B7.

Fine Diamond Abrasives and Accessories for precision lapping and fine micro-finishing are detailed in a catalog published by Penn Scientific Products Co., Abington, Pa. Discussed is elementary procedure in precision diamond finishing. The various products are described and a commercial standards grading table is given for the diamond powders. One section deals with industrial diamond tools.
Circle Inform-A-Gram No. B8.

SA Series Solenoid Actuated Valves is introduced in Catalog 8000A by Numatics, Inc., 106 S. Main St., Milford, Mich. These four-way operating valves can be used for controlling vacuum and air at pressures from atmospheric to 250 psi. Details, mounting dimensions, parts lists, diagrams and valve selection charts are found in the catalog. Also included is a section on control accessories.
Circle Inform-A-Gram No. B9.

Designed for Aircraft and Special-Purpose Spur Gears is a new automatic-cycle gear checker. A bulletin highlights its features and describes the equipment, operation and capabilities. This checking unit quickly measures and records parallelism, tooth taper and tooth spacing. Accuracy is to 0.0001". For details, see Bulletin 481-A published by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or —
Circle Inform-A-Gram No. B10.

A Grinding Wheel Net Price and Data Book has been announced by Raybestos-Manhattan, Inc., Abrasive Wheel Dept., Manhattan Rubber Div'n, Passaic, N. J. Book No. 6465 lists rubber and resinoid bonded grinding wheels and shows actual consumer net price for all quantities. It notes the sizes, shapes and types of grain available for industrial grinding wheels. Get your copy from the company, or —
Circle Inform-A-Gram No. B11.

Automatic Drilling and Tapping Units are highlighted in Bulletin 42-1-54 from Hypneumat Inc., 647 W. Virginia St., Milwaukee 4. They are available with mechanical or electrical stroke control up to 25" stroke, for single or continuous cycling. In addition to showing and describing the units, the bulletin also pictures a few typical parts that can be produced by the units.
Circle Inform-A-Gram No. B12.

Heavy-Duty, Multi-Position Polishing and Buffing Heads are highlighted in a bulletin issued by Murray-Way Corp., Box 180, Birmingham, Mich. Detailed and shown are the features of the 55 Series heads, which can be used for either right or left hand operation. In addition, the operational features are discussed. For complete details, obtain the bulletin from the company, or —
Circle Inform-A-Gram No. B13.

2428

The Hamilton No. 1-B Precision, Small-Gear Hobbing Machine. Speed, feed, and indexing each can be selected independently. *Consider that!*

YAK!
YAK!
YAK!

WE won't take your time to extol the virtues nor to rehearse the specifications of the Hamilton No. 1-B Precision, Small-Gear Hobbing Machine. Let us make but one point! *If you have small, precision gears to make, be they spur, spiral, bevel, or face gears, INFORM YOURSELF* about the Hamilton!*

*We will provide full information

FREE

Ask for illustrated Bulletin No. 2428
(No. 2428-A if you are interested in small, precision spur gears only.)

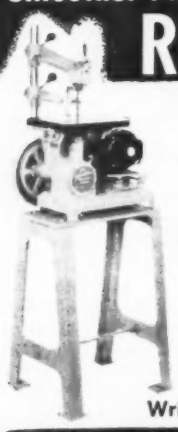
IT'S A *Hamilton Tool*
USE IT WITH CONFIDENCE

ADDRESS
THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 151

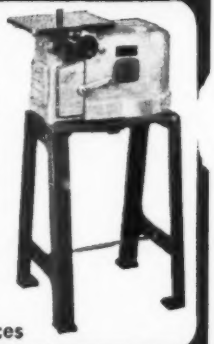
Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE



DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.



PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

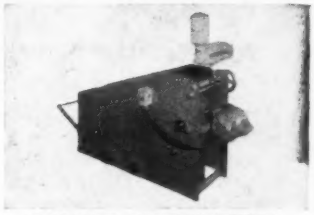
Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1521

economically priced press room equipment



DURANT "SURE-DRIVE" COIL CRADLE

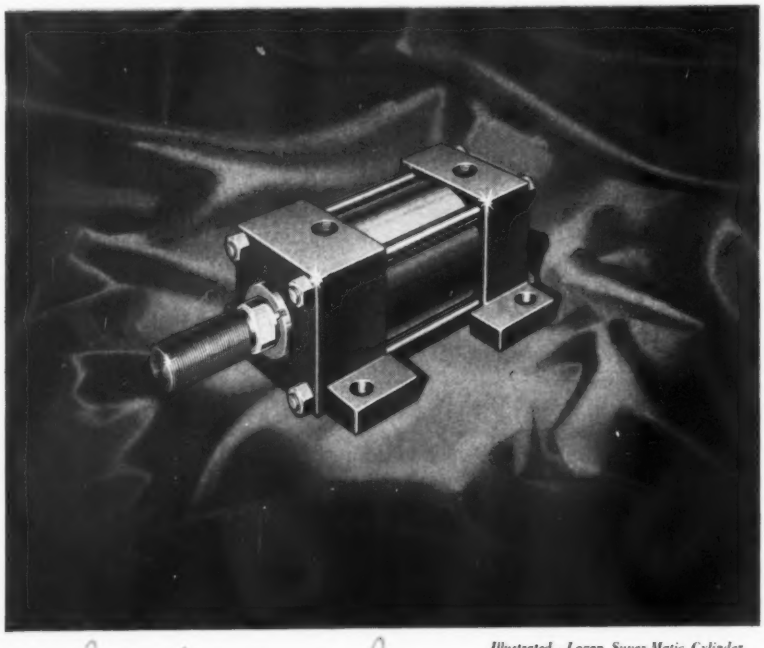
Easy to load trouble free performance provides constant slack loop for feeding presses, forming rolls, shears, slitters, etc. Available in 11 models wide variety of capacity O.D. maximum ranges 36" to 48" and width maximum ranges 10" to 20".

WRITE FOR NEW FREE CATALOG

DURANT Tool Supply Co.

PROVIDENCE 3, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 1523



Illustrated—Logan Super-Matic Cylinder Meets J.I.C. Standards

Look to Logan

the ultimate in hydraulic cylinder design

FREE SEND FOR THE "LOGAN CALCULATOR"

MEMBER: Natl. Mach. Tool Builders' Assn., Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
844 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 160-5-1 ULTRAMATION CYLINDERS
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 62 SURE-FLOW PUMPS
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
- ☐ 200-6 SUPER-MATIC CYLS.
- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CIRCLE INFORM-A-GRAM KEY NO. 1522

.0003 HOLE LOCATION IN 1 MINUTE

EDGE FINDERS

$2.50 NEW — POSTPAID except C.O.D. — $10.00 DELUXE

- THOUSANDS HAVE PROVEN AND ACCEPTED THE DELUXE MODEL FOR YEARS.
- JUMPS SIDEWAYS AS SHOWN WHEN LOCATION IS REACHED.

◄ NEW .500 DIA. MODEL FOR LARGER WORK ONLY. .200 Dia.►

ADJUSTABLE VISE STOP

$2.95

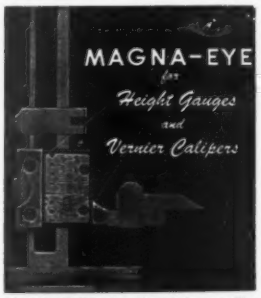
HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

Dealer Inquiries Invited

GLOVER MFG. CO.

422 Park Ave. Meadville, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1524



MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, poor work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.

Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

For Complete Information Write, Phone or Wire

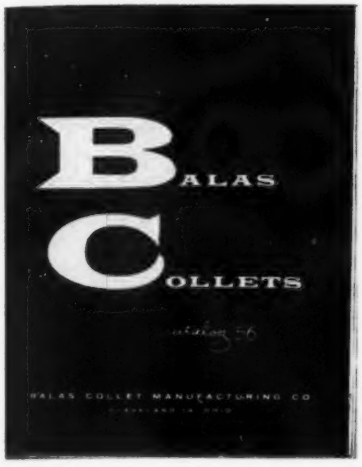
STEBAR COMPANY

215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1525

Boring, Drilling, Milling, reaming, counterboring, tapping, etc., are handled by Kwiklok quick change holders. They are used on boring mills, jig borers, milling machines, radials and turret lathes. A brochure covers Kwiklok holders, and also end mills and adapters. For complete information, see the illustrated brochure made available by Falcon Tool Co., P.O. Box 4605, Mt. Elliott Sta., Detroit 34, or —
Circle Inform-A-Gram No. B14.

Collets, Pushers, Feed Fingers and Pads for all types of screw machines are found in a new catalog. Also



listed are lathe collets. All are presented in an easy-to-find manner. Copies of Catalog 56 can be obtained by writing to Balas Collet Mfg. Co., Dept. C-2, Cleveland 14, or —
Circle Inform-A-Gram No. B15.

Precision Cylindrical and Indexing Grinding are handled by the Cylindex surface grinder attachment. It can be used for grinding tapers and flats, milling cutters and other intricate tools. A bulletin, in addition to describing the attachment, shows the Cylindex at work and illustrates some of the parts that can be ground. Also listed are the specifications. Binghamton Die & Machine, Inc., P.O. Box 1106, Binghamton, N. Y., will make available a bulletin containing details, or —
Circle Inform-A-Gram No. B16.

30-Ton and 50-Ton Cincinnati Press Brakes are highlighted in Bulletin B-6 from The Cincinnati Shaper Co., Cincinnati 25, O. The features are pictured and described, and general data and dimensions presented. These presses have a front controlled, variable speed drive from 20 to 50 spm. The company will provide copies of the bulletin containing complete information, or —
Circle Inform-A-Gram No. B17.

Facilitate Maintenance and Reduce Downtime to A Minimum with Hydra-Feed automatic tracer lathes. The unobstructed open-front provides faster loading and unloading and easier setup. A bulletin describes and illustrates the models available, complete with specifications. Also detailed are special tooling and special units and attachments. Copies of the bulletins are issued by The Bullard Co., Bridgeport 9, Conn., or —
Circle Inform-A-Gram No. B18.

A New Line of Straight Side Presses is covered in Bulletin 13300 from Baldwin-Lima-Hamilton Corp., Hamilton Div'n, Hamilton, O. Illustrations, descriptions and specifications are given for the single and double crank presses which have been designed specifically to meet exacting automotive production standards. Press features are itemized and explained in detail. Write to the company for your copy of the bulletin, or —
Circle Inform-A-Gram No. B19.

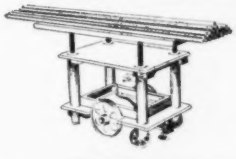
5603

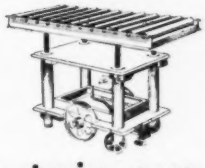
NOW!

NEW *Convenience*
NEW *Capacities*
NEW *Designs*

PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table





NEW provision for increasing table area!

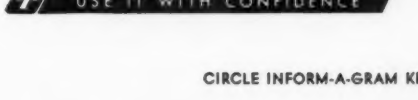
NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

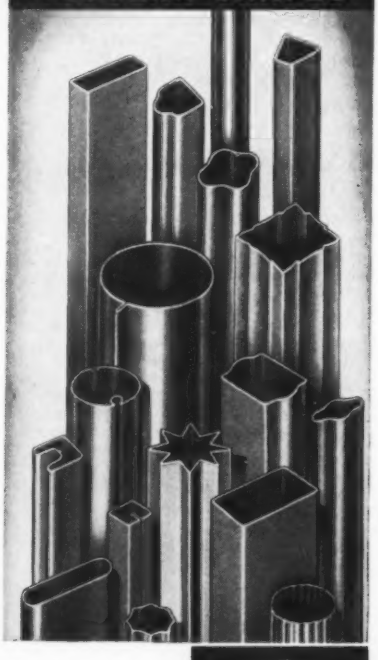
More stamina, more versatile performance than ever before

NEW FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.



CIRCLE INFORM-A-GRAM KEY NO. 153

COLD ROLL FORMING TUBULAR SHAPES



Among the wide variety of things you can make on a Yoder Cold Roll Forming machine are round, square, oval, rectangular and other tubular shapes, such as illustrated. The seams may be open, lapped, butted, dovetailed, interlocking, etc.—as shown in the drawing.

Millions of feet of such unwelded tubular shapes are made from coiled strip for conductor pipe, bedsteads, lamp stands, window channel, wiring raceways, carrying rods, etc. Production ranges from 20,000 to 50,000 feet per day, with only one operator and a helper.

Yoder offers you the cooperation of their engineering staff for designing and adapting their cold roll forming machines, auxiliaries, and tooling, for the low cost production of structurals, mouldings and trim, panels, tubular and other shapes, to meet individual needs.

The Yoder Book on Cold Roll Forming is a complete, illustrated text on the art and the equipment needed for performing a variety of operations which can be combined with cold roll forming, at little or no extra labor cost. A copy is yours for the asking.

THE YODER COMPANY
5501 Walworth Ave. Cleveland 2, Ohio

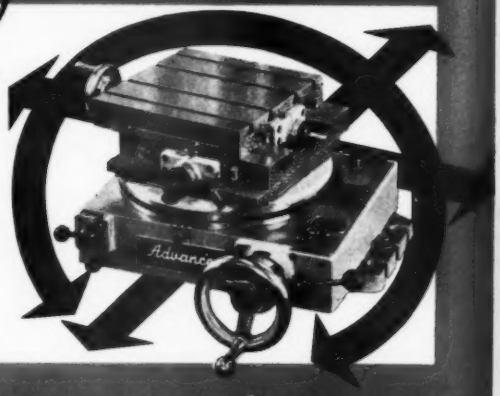
YODER ENGINEERING MANUFACTURING
COLD-ROLL FORMING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1541

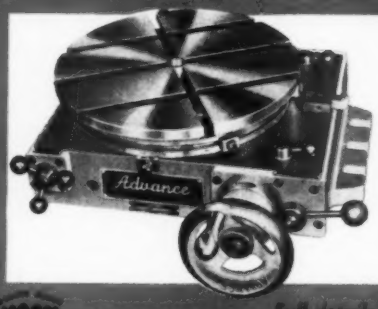
Developed by TOOL MAKERS for TOOL MAKERS

ADVANCE CROSS-SLIDE ROTARY TABLE

Permits fast, precise positioning of workpiece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table.



30 Seconds Accuracy



ADVANCE 15" ROTARY TABLE

This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision, and minimum maintenance fills the need for a precision unit at a moderate price.

Full details on request.

MORRISON ENGINEERING COMPANY
117 West Lake Street Dept. AT, Chicago 1, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1542

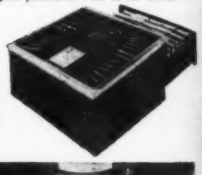
MICRO-MINIATURES...

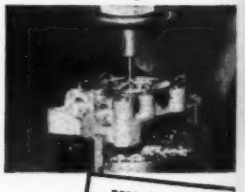
Small
END MILLS AND ROUTER BITS
Ground from SOLID. Made to do a NEW job of milling and routing at high speed and fast feed on production runs as well as in the tool room.

THE SECRET
of their durability and long life lies in our method of grinding which produces a smooth, unbroken cutting edge. No saw-tooth edge to load-up and break-down.

MICRO MINIATURES

See the display of Micro-Miniatures at your jobbers or write us for details.





DISTRIBUTORS *in principal cities*

When you think of small END MILLS — think of MICRO MINIATURES

Write for Catalog

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1543

Fatigue-Proof Bar Steel is being produced by a new process, elevated temperature drawing. With this bar steel, high production rates of closely dimensioned accurate parts are obtained. A 24-page brochure details

its uniform strength, controlled production, free machining, and resistance to fatigue. Several graphs and tables supplement the discussion. Shown in the brochure are a few of the typical parts that can be produced. Obtain copies of the brochure complete with specifications from La Salle Steel Co., P.O. Box 6800-A, Chicago 80, or —
Circle Inform-A-Gram No. B20.

Air Tools are the subject of 84-page Catalog 53 published by Thor Power Tool Co., Aurora, Ill. It contains complete descriptions and specifications of all Thor industrial air tools, covering 40 basic tools, with thousands of model variations, accessories

and adaptors. Featured are the Uni-Tork screwdrivers and nutsetters, No. 5V vertical grinders, No. 25G die grinders, No. 3 Series straight grinder, and additions to No. 4 Series.
Circle Inform-A-Gram No. B21.

Link-Belt Roller Chain Shear Pin Sprockets are now available from stock. These sprockets prevent damage from jamming and other overloads. A folder gives detailed information and tables listing stock sizes, torque ratings, hub dimensions and keyseats. Examples for selection and "problem and solution" instructions are presented. Direct requests for Folder 2749 to Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, or —
Circle Inform-A-Gram No. B22.

Eliminate Friction and Heat Generation during deep hole drilling operations with the Acromatic rotary oil inducer. This rotary spindle adaptor can be used for any machine tool application, horizontal or vertical, where oil must be fed through a rotating oil hole drill or gun drill. The rotary oil inducer is available in adaptor and thru spindle models. Details are found in a brochure published by Acromatic Tool Co., P. O. Box 56, College Park St., Detroit 21, or—**Circle Inform-A-Gram No. B23.**

VARIMATIC®

The SUPER SENSITIVE, SMALL-HOLE, PRECISION DRILLING MACHINE

With capacity of .004" to 5/16" in *all* drillable materials, and spindle speeds from 840 to 9300 R.P.M. infinitely variable in two speed ranges . . . *this* is the machine which the precision industries rely upon to handle the "heart-break jobs."

"for the finest work you do"

ALSO . . .

Three companion drills, each built to the same accuracy but differing in drive, speed range, and clearances, to cover the full range of special precision requirements.

AND A TAPPER . . .

with capacity from .034" x 120 to 1/4" x 24 . . . and a "reserve of accuracy."

2488

You will want full information about the Hamilton Line of precision drilling and tapping machines. And we will be glad to furnish it.

Ask for our
FREE
BULLETIN NO. 2488

ADDRESS

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 155

A Pneumatic Transmission System, which has been developed to provide a sensitive, accurate type of instrumentation, is described in Bulletin 750 prepared by Simplex Valve & Meter Co., 7 E. Orange St., Lancaster, Pa. Laminair produces an output air pressure which can be transferred and used to operate a distant receiving instrument. The air pressure varies directly with flow through a venturi tube, flow nozzle or orifice plate.
Circle Inform-A-Gram No. B24.

Bending Rolls are highlighted in Bulletin 352-D from Buffalo Forge Co., P.O. Box 985, Buffalo 5, N. Y. These bending rolls are used for circle, segment and spiral bending of angles, rounds, squares, tubes, beams, channels, flats and special shapes. The bulletin describes the rolls available and shows typical examples of work produced by them. Included in the bulletin are capacities. For copies, write to the company, or —
Circle Inform-A-Gram No. B25.

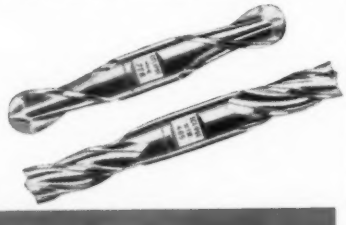
FINE CUTTING TOOLS
by Eclipse

Since 1913 Eclipse has been consistently and conscientiously serving many companies in widely diversified fields of production. Each of these companies has found that "Engineered by Eclipse" is assurance of genuine quality in end cutting tools.

- High Speed Steel Cutters
- Carbide Tipped Cutters
- Core Drills
- Inserted Blade Cutters
- Multi-Diameters
- Back Spotfacers

and remember . . .

Eclipse now has a complete line of Precision End Mills. Ground from the solid, Eclipse End Mills insure longer tool life, finer finishes and lower production costs.

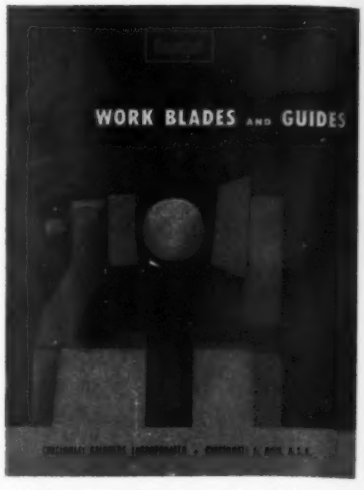


- Write for Counterbore Cat. No. 51
- Write for End Mill Cat. No. 56

ECLIPSE COUNTERBORE COMPANY
DETROIT 20, MICHIGAN
END MILL DIVISION—NORTH BRANCH, N. J. (ADDRESS BOX 97, RARITAN N. J.)

CIRCLE INFORM-A-GRAM KEY NO. 156

Work Blades and Guides for Cincinnati centerless grinding and lapping machines are covered in comprehensive Catalog G-678 recently announced by The Cincinnati Milling Machine Co., Cincinnati 9. Discussed are blade material, angle,



thickness and size, and setting the guides and blades. Contact the company for your copy of the catalog, or—**Circle Inform-A-Gram No. B26.**

Low Cost Handling of Parts and Materials is possible using the Stackbin System. An illustrated catalog covers the storage and handling system, providing detailed facts and figures on dimensions and prices. Templates are included to help users plan layouts. Copies of comprehensive Catalog 505 are made available by Stackbin Corp., 1223 Main St., Pawtucket, R. I., or —
Circle Inform-A-Gram No. B27.

Latest Developments in a line of automatic multiple transfer presses are noted in a bulletin published by The Baird Machine Co., Stratford, Conn. Also detailed are their basic principles of operation. These presses are used in the mass production of small parts. They feature a high degree of automation, coupled with speed and ability to maintain close tolerances with minimum downtime. The bulletin presents full details of tooling and production rates on a number of typical jobs.
Circle Inform-A-Gram No. B28.

Eliminate Layout and Cut Drilling Time with an adjustable drill jig. For example, it is used in drilling holes for cotter pins, set screws, oil holes in tubular sections and wiring holes in cap screws. Details on the drill jig, specifications and operation are given in a catalog sheet from Mathewson Machine Works, Inc., 38 Hancock St., Quincy 71, Mass., or —
Circle Inform-A-Gram No. B29.

Holomatic SYSTEMS

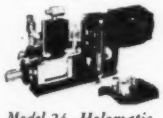
Double-end machine equipped with two Holomatic drill units. Available in three high-production models.

CUT DRILLING-TAPPING TIME

Model 24 – Holomatic Drill Unit Electric Motor Driven Spindle

Model 14 – Holomatic Drill Unit Air Motor Driven Spindle

Model 24 – Holomatic Unit For Drilling and Tapping



Model 24 – Holomatic for Deep Hole Drilling

Automatic Drill Press: Available in four base lengths with 1, 2, 3 or 4 Holomatic units vertically mounted.

● The modern high-production method for all automatic spindle type operations. Available as individual, self-contained power head units for installation on existing production machinery or as complete base-mounted machines with automatic controls.

Holomatic units operate on shop air line pressures for thrust and feature a self-contained hydraulic system for positive, accurate spindle travel and feed regulation. Traverse and feed rates are infinitely adjustable. Automatic, manual cycling, skip drilling, stops or dwell operations are easily arranged. Built-in air control valve simplifies set-ups and cuts installation time. Holomatic units operate efficiently at *any* angle.

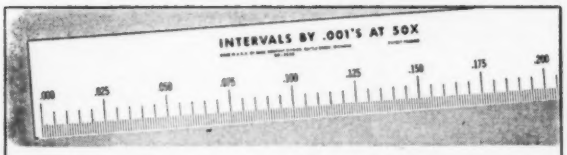
Amazingly versatile, accurate, the Holomatic systems can be quickly and easily set-up for single or multiple operations. A Holomatic system in your plant will quickly and easily pay for itself through savings in time, money and tools.

Survey your production equipment now and visualize how easily and economically a Holomatic unit or complete system could boost your production rates.

Write today for complete information, specifications and prices ... or, ask your Hause representative for an actual, obligation-free demonstration of the Holomatic System right in your plant!

Hause
ENGINEERING
MONTPELIER • • OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1571



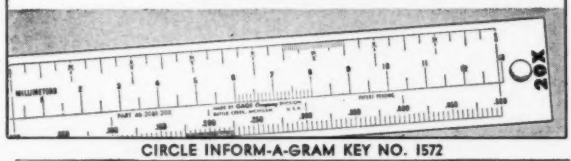
Gage Company **PRECISION PLASTIC**
COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

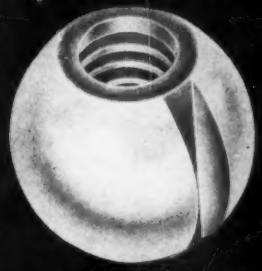
WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY
BATTLE CREEK, MICHIGAN



CIRCLE INFORM-A-GRAM KEY NO. 1572

MOLD COST FOR THIS PART?



Actual Size

Nothing!

Performance: **SUPERIOR**

Price: **CHEAPER**

SAVINGS effected by converting from bronze to Nylon paid for the mold of this spherical bushing.

Formerly it was a 5-step machining operation at a unit cost of .575 cents. It is now made in one operation. In 1000 lots each part costs .255 cents. *Savings on the initial order paid for the mold.*

LET US QUOTE ON YOUR SHORT-RUN PLASTIC MOLDINGS. WE WILL SUBMIT QUOTATIONS WITHOUT OBLIGATION.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1573

HOLD IT!

WITH WOODWORTH CHUCKING EQUIPMENT

Yes, you could compare the delicate but firm technique of the Labrador Retriever with the strong but accurate diaphragms in N. A. Woodworth chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

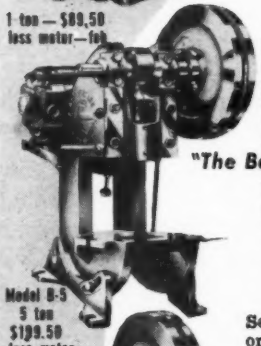
We invite your inspection and consideration of Woodworth chucking equipment.

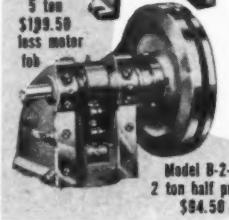
• Standard Diaphragm Chuck • Air-Operated Diaphragm Chuck • Bevel Gear Chuck • Double Diameter Gear Chuck • Finger Chuck • Air-Operated Diaphragm Arbor • Push-Lock Arbor • Twist-Lok Spline Arbor • Tork-Lok Collet Arbor • Zero Spindle Inspection Fixture

"Accuracy you can trust"

WOODWORTH
1300 East Nine Mile Road
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1581





Model B-2-A
2 ton half press
$84.50 fob

Heavy Duty Bench Type ALLEN PUNCH PRESSES

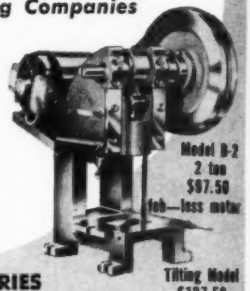
Powerful
Dependable and Economical
Fully Guaranteed

Designed for performance. Ruggedly built to give users long dependable service. The machine of a thousand uses. You will find Allen Punch presses adequate for many types of work now done on larger presses at greater expense.

"The Best Machinery Dollar Value on the Market"
Thousands have been Purchased by Leading Manufacturing Companies

Many Popular Models
1 to 5 ton capacities
Fully guaranteed

See Your Supply Dealer or write for FREE punch press catalog giving complete information, specifications and prices on our complete line of bench type punch presses.

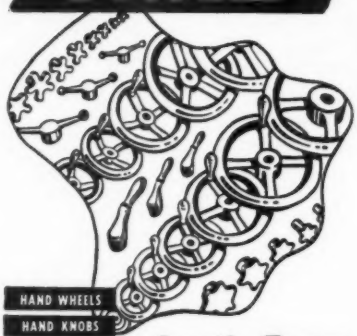


Tilting Model
$127.50
less motor—fob

ALVA ALLEN INDUSTRIES
Dept. TP Clinton, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1582

Tomco



HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO.
1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1583

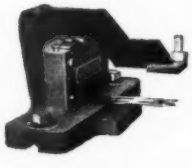
LIFTING DEVICES

for
FAST • SAFE • BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS

Prompt Delivery
Write for full particulars

H. L. BUSHMAN CO. 100 West Central Ave. Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1584



New Low Cost
AUTOMATIC SCRAP CHOPPER

3" wide $69.00
6" wide $95.00
12" wide $195.00

Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1585

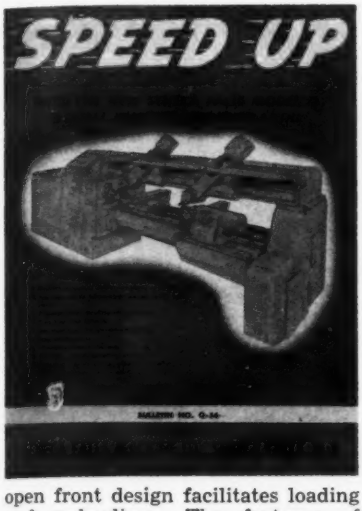
---

monroe
THE MOST PROGRESSIVE FIXTURE CLAMP LINE

Catalog available from
monroe
Engineering Products
1515 Hurd Road
Monroe, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1586

Rough and Finish Turning Shafts on a single machine without removing the workpiece from the centers between the two operations with Models LQ and AQ automatic lathes. Feed rate can be changed automatically during the cutting cycle. Their



open front design facilitates loading and unloading. The features of these machines, specifications and chip disposal methods are covered in Bulletin Q-56 released by Seneca Falls Machine Co., Seneca Falls, N. Y., or —
Circle Inform-A-Gram No. B30.

Low Cost Package Controls have been custom designed to suit individual machines or manufacturing processes. Director Systems direct a mechanism to perform a specific function at a specific time and together with Sensors continually check on the performance. Details on the systems are found in Bulletin 571 from Sensory Inc., New Vernon, N. J., or —
Circle Inform-A-Gram No. B31.

Stamping, Drawing, Forming, Riveting, Bending, cutting, blanking, etc. operations are performed by Allen bench type punch presses. These presses are described and illustrated in a new catalog. Also given are construction details, specifications, and special tooling and dies. Alva Allen Industries, Punch Press Dept., Clinton, Mo., will supply copies of the catalog, or —
Circle Inform-A-Gram No. B32.

"C-H Master Design" covers the entire oil-tight pushbutton line produced by Cutler-Hammer, Inc., 454 N. 12th St., Milwaukee 1, Wis. Included in the catalog are indicating lights, selector switches, rota-push buttons, covers and enclosures, and accessories. One section is devoted to dimensional data. Copies of Catalog EL-178 are made available by the company, or —
Circle Inform-A-Gram No. B33.

Produce Lustrous Finishes on nonferrous metals like brass, aluminum or bronze with a steel grit blast cleaning process. Case history material is included in a brochure, together with photos of typical parts processed by the airless abrasive grit blasting method. For complete details, get a copy of the brochure, "Steel Grit Provides Bright-As-A-Penny Non-Ferrous Finishes," from Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind., or —
Circle Inform-A-Gram No. B34.

Grind Geometrically Accurate Center Holes in stationary workpieces with the Swiss Technica center grinding machine. It is only suitable for grinding center holes with an included angle of 60°. Center holes or seats in hollow shafts of up to 2" I.D. can be ground. Three different sizes of grinding wheels are provided. Details are found in a bulletin from High Precision Products, 142 Greenwood Rd., Westfield, N. J., or —
Circle Inform-A-Gram No. B35.

J&L

SOLID ADJUSTABLE TAPS...

save money because:

- Chasers (not taps) give a full range of sizes and pitches
- Life is longer than with standard taps
- Size-control — infinite adjustment for pitch diameter

For full information on J&L Thread Tool Products . . .

Automatic Opening Die Heads & Chasers
Automatic Opening Collapsible Taps
Solid Adjustable Taps
Automatic Opening Stud Setters
Modern-Magic Chucks & Collets
A Complete Line of Accessories

. . . send for this free book

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, 510 Clinton St., Springfield, Vt., U.S.A.

Class III Guaranteed Not Sometimes, but Everytime!

J&L THREAD TOOL DIV.

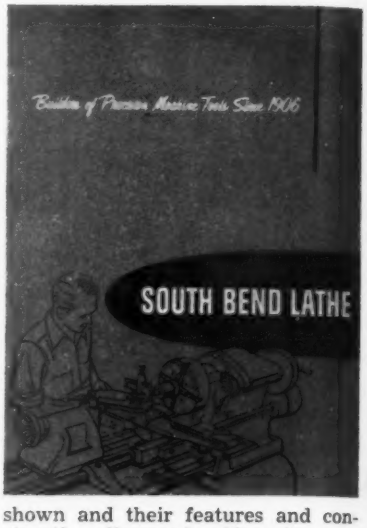
CIRCLE INFORM-A-GRAM KEY NO. 159

A New Catalog of Reinforced Resinoid Abrasive Products is being offered by Bay State Abrasive Products Co., Westboro, Mass. The index is arranged so that data on the right type of wheel can be selected by choosing the type of operation involved or material to be cut. Covered are raised hub disc wheels, abrasive cut-off wheels and resinoid straight wheels. The catalog gives specific recommendations for the use of each.
Circle Inform-A-Gram No. B36.

Industrial Two-Stage Air Compressors are covered in Bulletin CAS-17 from Curtis Mfg. Co., 1905 Kienlen Ave., St. Louis 20, Mo. The features are listed for both base mounted Model CW-100 and Model C-100 simple machine. These air cooled compressors eliminate expensive water bills and plumbing installation costs. The bulletin gives the specifications and shows a few typical applications. For copies, write to the company, or —
Circle Inform-A-Gram No. B37.

If your feeling the PINCH...
For want of a PUNCH...
Talk to the people at
3P
It's a fast service company, staffed with personnel who know that "DOWN-TIME" is "LOST-TIME". Distributors in principle cities assure IMMEDIATE DELIVERY from over 37,000 sizes in stock.
You get the finest quality in 3P HEAD PUNCHES and DIE BUTTONS, because they are made from 3 types of the finest tool steel, and are available in any DECIMAL size.
NEVER FEEL THE PINCH!
GET 3P PUNCHES AND DIE BUTTONS WHEN YOU NEED THEM.
Porter Precision Products also make BAL-LOK* Punches and Die Buttons. They're always in stock and ready for IMMEDIATE DELIVERY too. Any DECIMAL size.
NO EXTRA CHARGE FOR FAST SERVICE
HIGH QUALITY, OR ODD SIZES.
*Reg.
"Still the best performer"
PORTER PRECISION PRODUCTS
PRinceton 1-6338 • P.O.Box 208 • Cincinnati 15, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 160

Lathes are detailed in new General Catalog 5700 published by South Bend Lathe Works, South Bend 22, Ind. Included are engine, toolroom, and turret lathes; vertical spindle machines; bench shapers; drill presses; and pedestal tool grinders. The various models available are



shown and their features and construction discussed. Also given are the specifications. In addition, sections are devoted to attachments and floor space diagrams. For copies of the catalog, write to the company, or—**Circle Inform-A-Gram No. B38.**

For Drilling and Reaming Applications use an improved drill stop with a new micrometer depth adjustment. A bulletin uses diagrams and photos to describe the construction and use of this tool. It provides a positive control for depth of hole. Complete information is found in Bulletin 18-50 supplied by Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or—**Circle Inform-A-Gram No. B39.**

A Catalog of Stainless Steel AN Fasteners has been published by Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, L. I., N. Y. Described are the government specification aircraft bolts, slotted and Phillips machine screws, flat and round rivets, and washers carried in stock. Illustrations, stock sizes and principal dimensions are included for each item.
Circle Inform-A-Gram No. B40.

The Features of 13", 15" and 17" Geared-Head Precision Lathes are detailed in a catalog from Atlas Press Co., Clausing Div'n, Kalamazoo, Mich. Each of the models of Clausing-Colchester lathes is described, illustrated and the specifications listed. Also covered are the accessories. Complete information is found in the catalog provided by the company, or —
Circle Inform-A-Gram No. B41.

ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

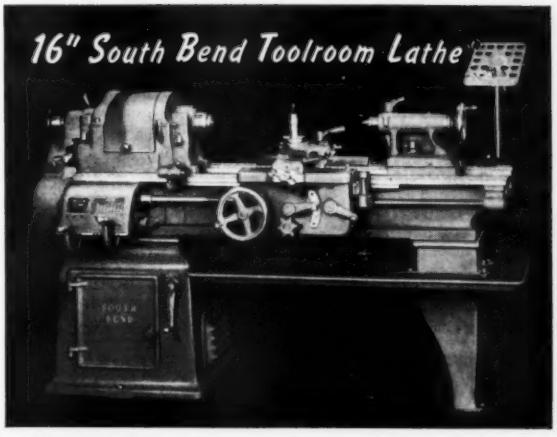
The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY

ABERDEEN, SOUTH DAKOTA

CIRCLE INFORM-A-GRAM KEY NO. 1611



$2930 f.o.b. factory 16" x 6' Toolroom Lathe less electrical equipment

—A BETTER VALUE

Here is a lathe that will give you maximum return for every dollar invested. Versatile . . . highly accurate . . . easy to operate, it makes difficult close-tolerance jobs easier. Designed for hard industrial use, it will continue to turn out, year after year, the kind of precision work modern tooling demands. And you'll be surprised at the low maintenance cost. Prompt delivery — time payment terms available. Write for catalog.

SOUTH BEND LATHE

SOUTH BEND 22, IND. • *Building Better Tools Since 1906*

CIRCLE INFORM-A-GRAM KEY NO. 1612

HAND KNOBS

6 SIZES

CAST IRON

Tapped, Reamed or Blank.

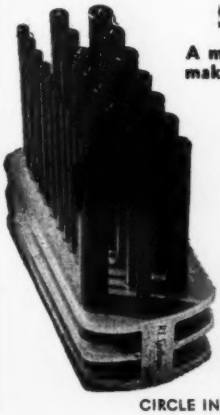
Hex-shaped hub for extra tightening.

Write for catalog

TIETZMANN TOOL CORPORATION

Dept. HK-2 • Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1613



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—Sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

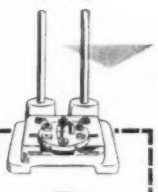
CIRCLE INFORM-A-GRAM KEY NO. 1614

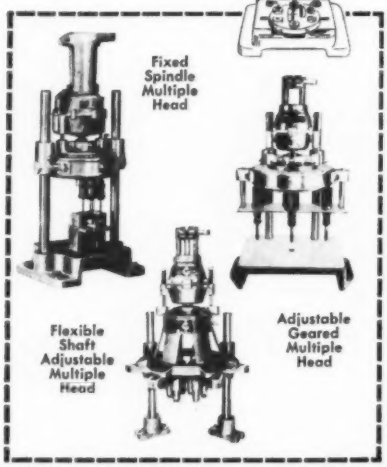
LET'S PUT OUR MULTIPLE HEADS TOGETHER!

...and plan your small hole drilling and tapping operation on a low cost, maximum production basis

ETTCO-EMRICK
MULTIPLE SPINDLE HEADS
UNIT-ENGINEERED

for drilling or tapping on any drill press





No one type will do for every job. That's why we make 'em all — and the correct custom tooling for faster handling of the parts. The Ettco system is a completely integrated service; not just multiple heads with spindles reaching into the air.

Ettco engineers can tell you without obligation which type best suits your specific job. They're all easily attachable to any drill press, tapping machine or automated special. Standardized, reuseable components mean lowered costs. Interchangeable face plates permit quick switch from tapping to drilling. Send us a sample part or drawing for recommendations — now, and ask for our catalog. *Distributors throughout U. S. and Canada.*

The only complete line manufacturer of drilling & tapping equipment for the entire small hole field

Ettco-Emrick

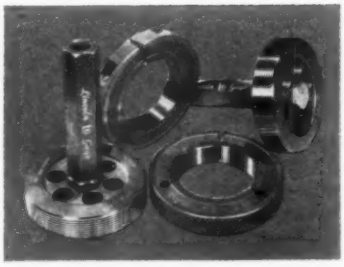
ETTCO TOOL & MACHINE CO., INC.
584 Johnson Avenue, Brooklyn 37, N. Y.
TAPPING ATTACHMENTS • MULTIPLE HEADS • DRILLING & TAPPING UNITS AND MACHINES • SPECIAL MACHINES
INDEXING FIXTURES • TAP & DRILL CHUCKS

CIRCLE INFORM-A-GRAM KEY NO. 1621

Customers are not just names

Customers are people, important people. Sometimes their work furrows their faces with frowns, other times warm smiles. They all have one thing in common, a job to do. Because we are keenly aware of this, every skill at Lincoln Gage Co. is harnessed to achieve one goal — eliminate from customers' working hours such gage worries as missed delivery dates and inaccurate gages.

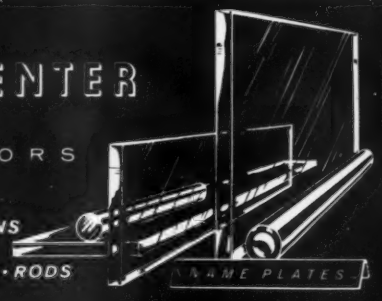
All gages, thread or cylindrical, are hardened as specified, ground to the high tolerance limit for longer wear life, full lapped, and thread gages are minutely inspected to be sure no drunken threads exist. As a final extra, gages are so packaged that they will not be injured in transit. May we have the opportunity of taking gage worries out of your working days?



LINCOLN GAGE COMPANY
23902 Harper Ave.,
St. Clair Shores, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1622

Plastic CENTER
DISTRIBUTORS



ENGRAVED SIGNS
SHEETS • TUBES • RODS
PLEXIGLAS • NYLON • TEFLON
KODAPAK • PHENOLICS

127 N. WATER ST. • ROCHESTER 4, N. Y. • HA 6-5655

CIRCLE INFORM-A-GRAM KEY NO. 1623

A Complete Line of Small Air-Cooled Compressors is shown in a 16-page bulletin offered by Gardner-Denver Co., Quincy, Ill. Both one- and two-stage compressors are available with working pressures ranging from 85 to 175 psi, and with a wide

selection of controls for automatic starting and stopping and for constant speed installations. Models shown include bare compressors and those with horizontal and vertical tanks. Request copies of Bulletin AC-15 from the company, or — **Circle Inform-A-Gram No. B42.**

A 1957 Equipment Manual has been issued by Precision Equipment Co., 3706A Milwaukee Ave., Chicago 41. Covered are industrial ovens, office equipment, modern flow lockers and a transistorized portable public address system. For your copy of the manual, write to the company, or—**Circle Inform-A-Gram No. B43.**

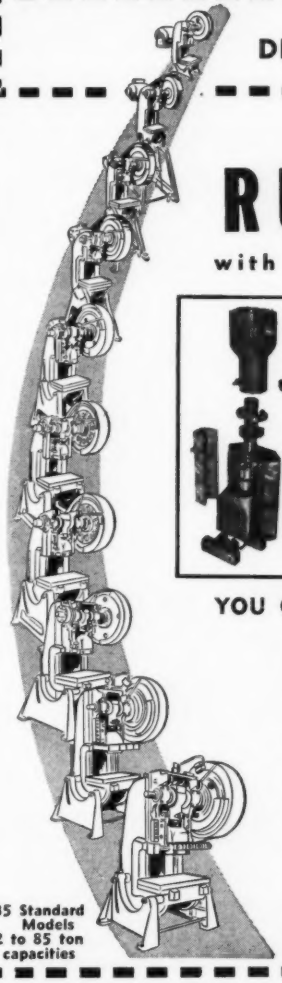
Measure Coating Thickness with the Magne-Gage and Filmeter gages. The Filmeter is used in special applications where the Magne-Gage will not operate. Features, operation, applications and technical data are given in Bulletin 2253 released by American Instrument Co., Inc., 8030-8050 Georgia Ave., Silver Spring, Md., or — **Circle Inform-A-Gram No. B44.**

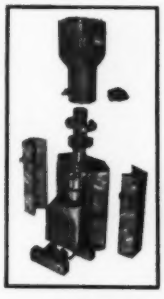
Operation of a Tubular Screen Filter for low micro-inch finish requirements is described in a brochure. Schematics show filtering and backwash cycles. Automatic, self-cleaning Delpark filter is used in filtering coolants, cutting oils, rolling oils, solvents and all liquids requiring the removal of minute particles. Flow capacities are 5 to 1000 gpm. It is equipped with conveyor flights for the automatic removal of filtered solids. Industrial Filtration Co., Dept. FM-299, Lebanon, Ind., will make available a bulletin with further information, or — **Circle Inform-A-Gram No. B45.**

Induction Heating Equipment is the subject of a bulletin from Magnethermic Corp., Youngstown 7, O. The bulletin contains charts which indicate the high frequency equipment to be used for various hardening applications and the application data for 60-cycle equipment on various metals used in the hot working field. In addition, high and low frequency induction heaters are illustrated and described. Contact the company for copies of the bulletin, or—**Circle Inform-A-Gram No. B46.**

Difficult and Unusual Grinding Applications are described in "Case Histories" published by Mattison Machine Works, Rockford, Ill. The booklet containing 14 illustrated grinding case histories covers surface grinding applications being performed by machine tool builders, automotive plants, makers of tool steel products, etc. The booklet is designed for methods engineers and production men interested in controlling quality and reducing costs. **Circle Inform-A-Gram No. B47.**

DISCOVER THE *"difference"*
in
RUGGEDNESS
with PRESS-RITE POWER PRESSES


35 Standard Models 2 to 85 ton capacities



Heavy semi-steel frame with specially designed reinforcements*
•
Wide main bearings
•
Oversize crankshafts
•
Full Vee ramways

YOU GET MORE PRODUCTION . . . and better production . . . over a longer time because PRESS-RITE Presses are more rugged. *Heavy, semi-steel frame (with built-in steel tie rods on 45, 65, and 85 ton models) . . . oversize crankshafts in relation to press capacity . . . and large bearing surfaces where they are needed for crankshaft and ramway . . . plus many other features, provide the maximum ruggedness in your PRESS-RITE PRESS. Over 35 models, high speed, standard, and backgeared, from 2 to 85 ton capacities.

**Write for the new Press-Rite catalog No. 855 with complete information on all models. It's FREE. Write*

Press-Rite Division of Sales Service Machine Tool Company, 2351 University Avenue, St. Paul, WI4, Minnesota.

FREE CATALOG Write for Press-Rite catalog No. 855 with illustrations and specifications of all models, 2 to 85 ton capacity.

USED BY MORE...FOR MORE PRODUCTION

PRESS-RITE

OPEN BACK • INCLINABLE *Power Presses*

CIRCLE INFORM-A-GRAM KEY NO. 163

Ultrasonic Non-Destructive Metal Testing is performed by a packaged test unit utilizing the Immerscope. Model PT1001 is designed for stabilizing high quality control standards while lowering inspection costs. It is a portable unit, ready to plug in and operate, for detecting internal flaws. For details, see a bulletin prepared by Curtiss-Wright Corp., Industrial and Scientific Products Div'n, Curtiss-Wright Corp., Caldwell, N. J., or —
Circle Inform-A-Gram No. B48.

Immediate Tool Changes for Different Operations are possible with Quik-Tool ready-set tooling. It eliminates lengthy setups and reduces tool change time to a matter of seconds. A bulletin describes the ready-set tooling and pictures a Quik-Tool set with details on each unit. In addition, typical applications and parts are shown. Copies of Leaflet 306 containing complete information are issued by The Monarch Machine Tool Co., Sidney, O., or—**Circle Inform-A-Gram No. B49.**

LEMPCO STYLE "M" and "L" DIE SETS

NEW

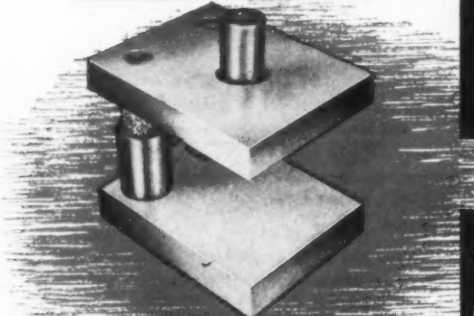
ALL-STEEL
DIE SETS AT THE PRICE OF
CAST IRON!

BALL-BEARING ANTI-FRICTION PIN BUSHINGS

EASIEST AND FASTEST TO ASSEMBLE OR DISASSEMBLE

PRECISE ALIGNMENT FOR MILLIONS OF STROKES

ZERO MAINTENANCE; ONLY CUP GREASE AT GRINDING TIME



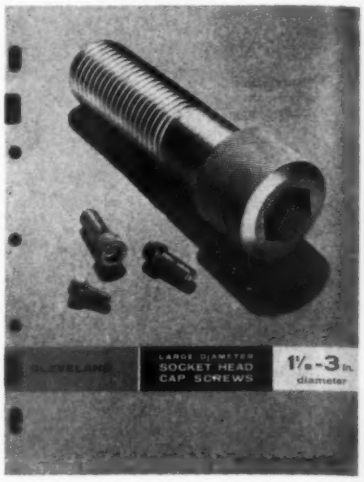
NOW, Lempco's line of Precision Ball-Bearing Die Sets, includes new low-priced *all-steel* sets, Style "M" and "L", at the price level of *friction-type cast iron* die sets. Better write TODAY for New Low Prices!

LEMPCO INDUSTRIAL, INC.
DUNHAM RD., BEDFORD, OHIO

WHERE QUALITY CONTROLS!

CIRCLE INFORM-A-GRAM KEY NO. 164

Stronger Assembly of Large Components for heavy machinery and equipment is possible with the increased head diameters of large socket head cap screws. Head diameters of screws from 1⅛" to 3" dia and socket dimensions across flats have



been increased. The range of physical properties for the larger size socket head cap screws in both coarse and fine thread series is detailed in a folder. For copies of the folder, contact The Cleveland Cap Screw Co., Box 600, 2917 E. 79th St., Cleveland, or —
Circle Inform-A-Gram No. B50.

Principles and Operation of the Digimatic tape control system for machine tools are discussed in a 12-page booklet. The system, composed of a planning desk, a high-speed special purpose computer and a machine control unit, provides numerical control through magnetic tape. The booklet also tells how small manufacturers can contract for the preparation of the tapes through a service offered by the company. Electronic Control Systems, Inc., 2136 Westwood Blvd., Los Angeles 25, will supply copies of the booklet, or —
Circle Inform-A-Gram No. B51.

Index, Station and Combination Milling are performed by the Index Mill-Matic. This standard automatic production milling machine features an accurate index mechanism as an integral part of the horizontal work table. An eight-page folder shows typical tooling arrangements and specific production jobs. In addition, cross-sectional drawings, design and construction features, and specifications are found in the folder. Obtain copies from The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn., or —
Circle Inform-A-Gram No. B52.

You Can Rely on a **ROUSSELLE**

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

Choice of 25 models in 5 to 40-ton sizes.

Manufacturers of Rousselle Presses

SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1651

AUTOMATIC GRINDER FOR METAL SAWS

Cuts Costs . . . Makes Money For You!

Pays for itself time and time again. Will sharpen as many as 250 Milling Cutters, Slitting and Screw Slitting Saws .015" thick at one time with a variation, plus or minus .001" of exact diameter for entire lot. Automatically indexes the gang of saws, one row of teeth at a time.

WARDWELL MANUFACTURING CO.
3809 Ridge Rd., Cleveland 9, O.

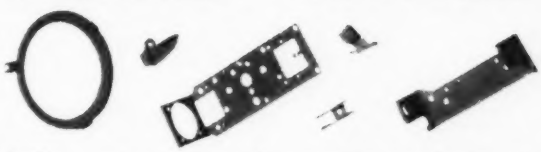
Steady, accurate, durable. Grind either wet or dry. A time and money saver.

Ask for Bulletin describing 57T

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1652

STAMPINGS - - - SHORT RUNS



A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

Linden 3-3700 "Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1653

They're now available from stock in new standard 18" lengths!

ACE LONGBOY DRILLS

Been buying costly "specials" for deep hole drilling operations? Then you'll be glad to know that Ace Longboy Drills are now available from stock in a wide range of standard sizes and in both 12" and 18" lengths! What's more, their polished flutes are precision ground in top quality pre-hardened high speed steel to provide a finer finish, keener cutting edges, and longer drill life.

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN

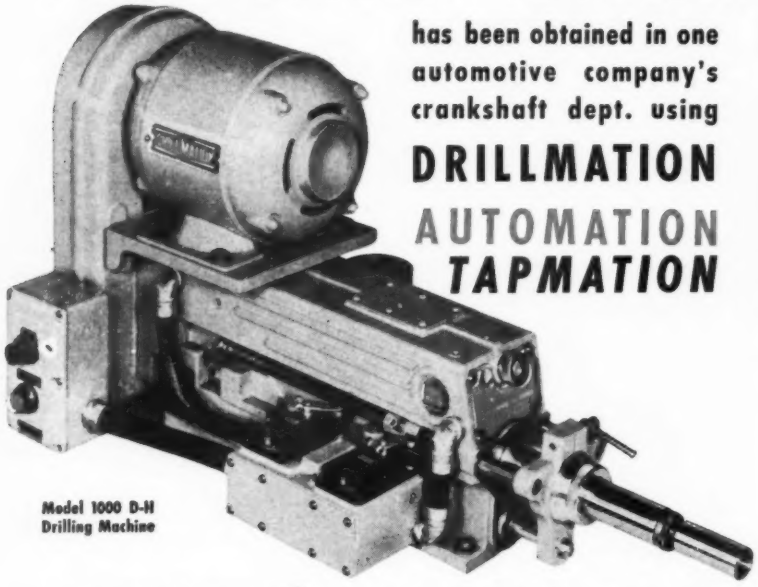
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1654

300% Greater Tool Life

has been obtained in one automotive company's crankshaft dept. using

DRILLMATION
AUTOMATION
TAPMATION



Model 1000 D-H
Drilling Machine

12 NECESSARY, *Exclusive* FEATURES IN 1 UNIT

- **DULL TOOL CONTROL** Unit will withdraw tool from work and indicate to operator when tool becomes dull.
- **RAPID TOOL CHANGE** Tool may be replaced without changing the controls.
- **UNIFORM TIME CYCLE** Maintains comparatively constant time cycle even when tools become dull.
- **SELF-CONTAINED HYDRAULIC SYSTEM** Delivers only the oil pressure required to overcome machining resistance.
- **COMPLETELY AUTOMATIC** Enclosed electric controls. Unit is "Fail Safe".
- **THRUST CONTROL** Maximum thrust may be set to protect tools. Will not surge at break point.
- **FEED CONTROL** Infinitely variable and positive feed rate.
- **RAPID APPROACH AND RETURN** Variable irrespective of RPM.
- **MICRO DEPTH CONTROL** Depth will repeat within .0005 inch.
- **EMERGENCY QUILL RETURN** Button on front of unit. Aid in setting tools.
- **COOL OPERATION** Low volume high pressure hydraulic pump used on power stroke only. Air power used for rapid traverse.
- **PRODUCTION MACHINE** Mount in any position. Quiet operation. Self lubricating.

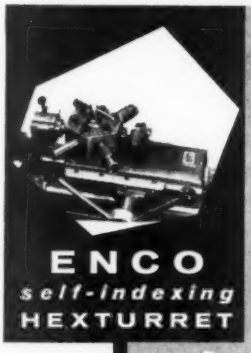
DRILLMATION

"FOR THE HOLE FIELD"

DRILLMATION CO.
6500 E. ELEVEN MILE ROAD
CENTER LINE, MICHIGAN
JEfferson 9-2030

CIRCLE INFORM-A-GRAM KEY NO. 1661

how DOUBLE means constant accuracy!



ENCO *self-indexing* HEXTURRET

Enco Hexturret accuracy at work. A close tolerance shoulder screw job held to plus .002; minus .000.

Double Drive An Enco exclusive! Twin steel gears and racks equalize feed of tool on work, prevent twisting, assure precision.

Double Gibs Heavy duty type with close adjustment for maintaining constant accuracy.

- Custom-built to fit all-lathes from 9" to 16".
- All bearing surfaces hand scraped
- All parts of indexing mechanism hardened to assure accuracy.

There's an ENCO turret for every lathe. Write today for Catalog No. 53.

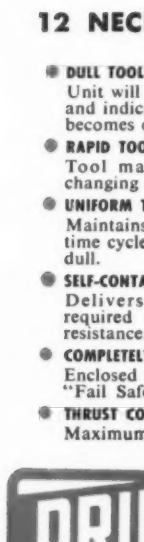
ENCO
Manufacturing Co. • 4524 W. Fullerton
Chicago 39, Ill. • Dept. 737

CIRCLE INFORM-A-GRAM KEY NO. 1664

Low Cost Automatic
HORIZONTAL STOCK REEL
Self-powered
24" dia. **$85.00**
30" $90.00
36" $95.00
Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass

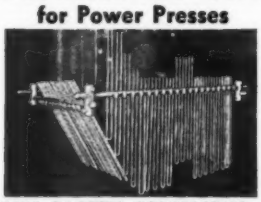
CIRCLE INFORM-A-GRAM KEY NO. 1665



HARDNESS TESTING
has been done with the **SCLEROSCOPE**
Since 1907
•
THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1662

ADJUSTABLE ROD GUARD
for Power Presses



HUMM SAFETY EQUIPMENT CO.
MFGR. OF COMPLETE LINE OF PRESS GUARDS
249 Sheffield Ave. • BROOKLYN 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1663

CAMS ALL TYPES MADE TO YOUR SPECS

Mfrs' agents wanted
Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

EISLER ENGINEERING CO., INC.
732 SO. 13TH ST., NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1666

Hobs, Master Gears, Broaches, and Boring and Form Tools are included in the latest catalog from National Tool Co., 11200 Madison Ave., Cleveland 2. Also covered in the catalog are shaper, shaving and milling cutters. One section is devoted to miscellaneous special tools. In the engineering section are found rules and formulas for spur and helical gears, gear nomenclature, gear tooth dimensions, dimensions and tolerance charts for multiple thread milling cutters, and data on taper shanks.
Circle Inform-A-Gram No. B53.

Barrel Finishing with Exolon tumbling abrasive is discussed in a folder from The Exolon Co., Tonawanda, N. Y. This solid aluminum oxide combines extreme surface abrasive action with mass weight. The folder presents general recommendations for barrel finishing and shows some parts that have been finished with Exolon. Details are given in the folder supplied by the company, or —
Circle Inform-A-Gram No. B54.

Model 62 Automatic Bar Machine is detailed in a catalog from New Britain-Gridley Machine Div'n, The New Britain Machine Co., New Britain, Conn. The features of the machine are shown and discussed. Also described are the four basic attachments. In addition, standard equipment and specifications are listed. Copies of the bulletin are made available by the company, or —
Circle Inform-A-Gram No. B55.

Quickly and Accurately Check Pitch Diameter on Splines and Gears with a bench-model comparator. It also checks lengths of parts, shoulder distances, center to center, and O.D. and I.D. dimensions. A circular illustrating the comparator, presenting descriptive information and giving the range and accessories available is provided by Jerpbak-Bayless Co., Solon Rd., Solon, O., or —
Circle Inform-A-Gram No. B56.

High Power Ultrasonic Generators and Transducers are described in Bulletin DR-2000 made available by Acoustica Associates, Inc., Glenwood Landing, L. I., N. Y. Detailed are two generators, Model DR-2000A1 and DR-2000Ah which can be used for powering large scale, high volume batch or automated ultrasonic cleaning, machining and liquid processing systems. Several typical tank arrays are illustrated, specifications given and applications listed.
Circle Inform-A-Gram No. B57.

Carburizing, Carbonitriding and Hardening Operations are handled by Automatic A Model heat treating units. Fast uniform results are assured with 100% forced convection heating. A bulletin contains a diagram pointing out the construction features of the heat treating units. Also detailed are the complete atmosphere and cycle controls. Ipsen Industries, Inc., 715 S. Main St., Rockford, Ill., will provide copies of Bulletin T-19A with details, or —
Circle Inform-A-Gram No. B58.

How to BAK-up to a job...

with the newest precision tool in the Cogsdill Finishing Tool Family

* *The BakSink Tool*

. . . offers a rapid and direct access for cutting angles or radii on reverse surfaces . . . some back-facing and grooving operations.

Designed to offer micro-set accuracy within close tolerances, the BakSink tool is completely adaptable for production use as it requires no specialized equipment, spindle or workhead.

PRECISION COUNTERSINK FROM SPECIAL DESIGN

The production situation at left dramatizes but one of several applications of the BakSink tool. Let our Engineering Staff design this tool to fit your needs.

Contact our Engineering Staff regarding your particular production needs.

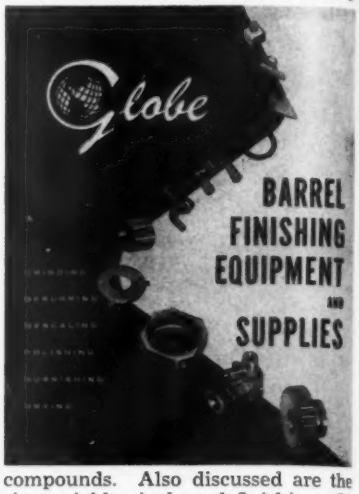
TOOL PRODUCTS, INC.
12890 W. Eight Mile Road Oak Park 37, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 167

The Features of Forged T and T Slot Bolts are detailed in a four-page catalog prepared by Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10. Also provided are charts giving information and types and sizes for all shop requirements. These bolts are two to three times as strong as ordinary soft forged bolts. The fully machined head fits all table slots. Obtain copies of the catalog from the company, or —
Circle Inform-A-Gram No. B59.

Lubricants for Stamping and Deep Drawing are the subject of Bulletin 138 from Magnus Chemical Co., Inc., Dept. T & P, Lubricants Div'n, Garwood, N. J. The bulletin contains information on choosing the right lubricant for a specific condition of operation. Each is listed by product name, with a detailed description of its properties and its specific application to metals and the concentrations used.
Circle Inform-A-Gram No. B60.

Grinding, Deburring, Descaling, polishing, burnishing and drying operations are facilitated with Globe barrel finishing equipment and supplies. A catalog includes information on different types of abrasive and burnishing media and necessary



compounds. Also discussed are the six variables in barrel finishing. In addition, before and after photos of parts which have been deburred, polished, etc., are included. Casalbi Co., Globe Div'n, Box 411, Jackson, Mich., will supply copies of the general catalog, or —
Circle Inform-A-Gram No. B61.

The 1957 Catalog of industrial construction and automotive portable power tools has been announced by Skil Corp., 5033 Elston Ave., Chicago 30. Highlighted are 10 additions to the line. Tools are presented in logical sequence of size and duty rating. Specifications are listed in tables at the bottom of each page to permit easy selection of tools. Obtain copies of the catalog from the company, or—**Circle Inform-A-Gram No. B62.**

Ultrasonic Fluxless Brazing is performed by Sonobraze ultrasonic equipment. Its advantages include simplified tooling, elimination of a cleaning operation required after brazing, and provision for a stronger bond at the brazed joint or coated surface. Details on Sonobraze equipment are found in Bulletin SBR-6A from Aeroprojects Inc., 310 E. Rosedale Ave., West Chester, Pa., or —
Circle Inform-A-Gram No. B63.

Carbide and Hi-Speed Cutting Tools are produced from a tool or part print by Wetmore Tool & Engineering Co., 5320 E. Washington Blvd., Los Angeles 22. Included are flat, dovetail and circular form tools; step drills; reamers; gun reamers; multiple operation tools; form milling cutters, etc. Further details on these special tools are found in a bulletin put out by the company, or—**Circle Inform-A-Gram No. B64.**

DURABLE
Sleeve Supported
PERFORATORS

For Spring-Loaded Or Solid Stripper Designs

Get greater productivity and LONGER LIFE with Durable Sleeve Supporter Perforators. Punch holes easier, faster and more accurately in SOFT and HARD, THICK and THIN materials. You get positive alignment, closer clearances and burr-free holes. Durable Perforators DO NOT BREAK because they are supported throughout the full stroke by the intermeshing sleeves.

Durable Perforators, Vertically Lapped, and Electrocoted, strip easier, eliminate galling and REDUCE PRESS DOWNTIME.

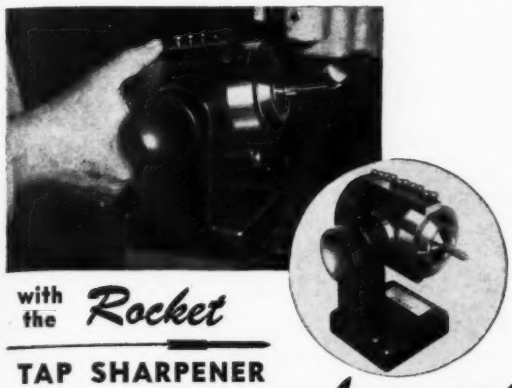
IF IT'S DURABLE IT'S DEPENDABLE

Two decades of punching know-how assures you practical answers to your perforating problems. Ask for our new Durable Catalogue, and Engineers Handbook. It's FREE.

Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
1214 W. Madison Street, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 168

REDUCE TAP COSTS UP TO 75%



with the *Rocket*

TAP SHARPENER

a low cost

fixture that sharpens dull taps

- quickly
- economically
- accurately

Push button control — no cams needed. 50 series for 2, 3, 4 flutes collet capacity to 1-1/16". 60 series for 4, 5, 6 flutes collet capacity to 2-1/4". Special orders for additional flute capacities.

Use on any tool and cutter grinder or small surface grinder . . . Guarantees precision sharpening through accurate grinding.

Write for demonstration and literature

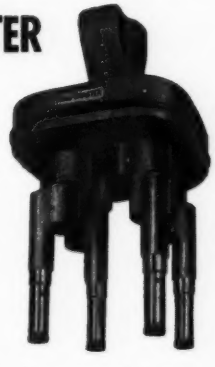
ROCKFORD DIE & TOOL WORKS, INC.
1820 Seventeenth Ave. Rockford, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1691

Buy THRIFTMASTER

Double Eccentric Adjustable

DRILLHEADS



The only heads of this type standard with

Full Ball Bearing Construction

- greatest flexibility in drilling irregularly spaced holes
- sustained accuracy for trouble-free operation
- 20 Standard Models—3 to 8 Spindles
- Special Models on Order

Makers of
DORMAN AUTOMATIC
REVERSE TAPPERS

Write today for complete information on this *dependable* Double Eccentric Adjustable Drillhead . . . the latest addition to the Thriftmaster line of Single Eccentric Universal Joint Type Adjustable and Special Fixed Center Drillheads.

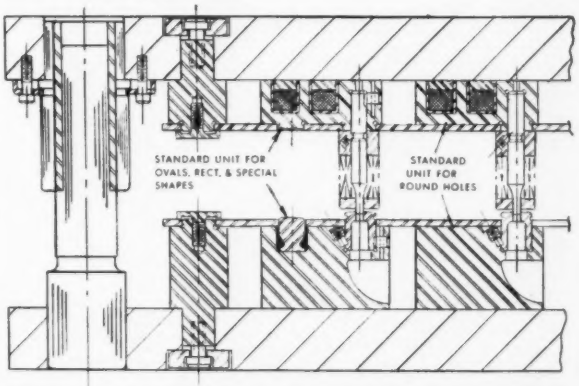
THRIFTMASTER
Products Corporation
A SUBSIDIARY OF
THOMSON INDUSTRIES, INC.

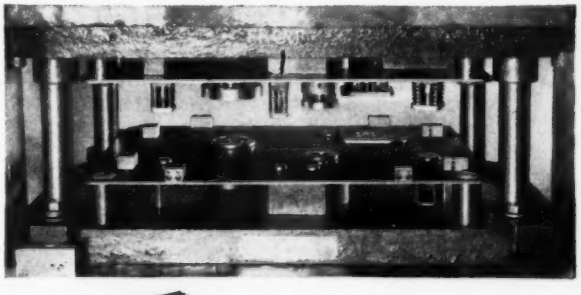
1012 N. Plum St.
LANCASTER, PA.

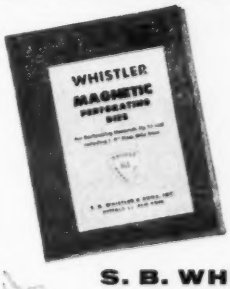
CIRCLE INFORM-A-GRAM KEY NO. 1692

MAGNETIC DIES by WHISTLER

• Operate like a single-purpose die • All punch and die parts interchangeable • Pierce metals up to ¼" thick steel • Changes made from one operation to another while the die set is in the press • Change-over time from 5 to 20 minutes, depending upon size of die set • Lower die costs • Saves die storage space • Precision work in any size press • Backed by Whistler's 40 years of die making experience serving the nation's leading plants.







YOU NEED THIS CATALOG... Shows by photos, drawings and prices how the Magnetic Die* system drastically cuts die costs, saves valuable time, speeds production. *Write for it today.*

**Whistler Magnetic Dies are fully patented and are sold under the registered trade name Magna-Die.*

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1693

New CATALOG

WM. SOPKO & SONS CO.

GRINDING WHEEL ADAPTERS

AND TOOLROOM ACCESSORIES

finest quality ADAPTERS

- Precision-made, Hardened and Ground with Heat Treated Nuts
- Complete Line—4 New Models Available
- For Use on All Popular Surface Tool and Cutter Grinders
- Large Stocks—Immediate Delivery

USE SOPKO ADAPTERS—SAVE TIME, TROUBLE AND MONEY

WM. SOPKO & SONS CO.
140 E. 267th ST. • EUCLID 32, OHIO

Please send your New Free Illustrated CATALOG

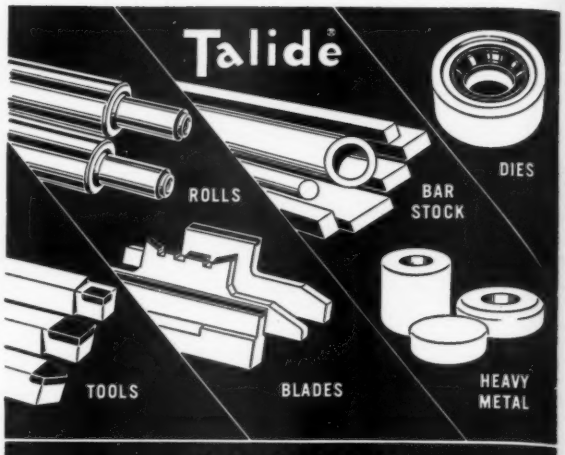
NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1701



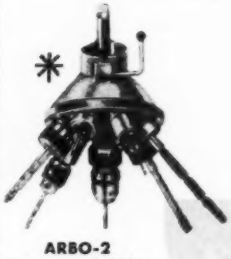
HARDEST MAN-MADE METAL!

● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 1702



ARBO-2
automatic indexing turret type multi-spindle drill head

DRILLS *from 2 to 7 holes*
TAPS *from 2 to 7 different sizes in one chucking*

JEMCO'S ARBO-2 fits any single spindle vertical drill press

all operations completed with one chucking — no reversing of drill spindle necessary for tapping — speeds changed quickly — reduces machining time-tapping capacity 1/8 to 9/16-drilling capacity 0 to 19/32

EXCLUSIVE TERRITORIES OPEN write for complete information to . . .

Jersey manufacturing company
401-B LIVINGSTON ST. • ELIZABETH, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1703

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS . . . *UNMARRED* BY TOOL WITHDRAWAL MARKS

THE NEW **RELIEVOMATIC**
SELF-RELIEVING TOOL HOLDER

SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS

Avoid scratches like this

All clear with "Relievomatic!"

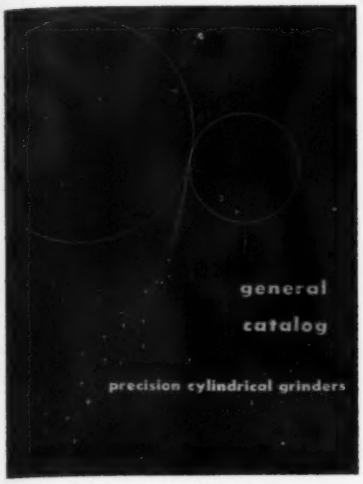
Easily installed on cross-slide or turret

Write today for details.

SILBER PRODUCTS, INC. WOrth 6-1133
134 Lafayette Street • New York 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1704

Standard and Single Purpose Precision Cylindrical Grinding Machines are featured in Condensed General Catalog CG-56 from Landis Tool Co., Waynesboro, Pa. One section is devoted to standard grinding machines



and another to special purpose ones. Each model is shown and described and the features and specifications given. Also noted are the uses for each. The company will make available copies of the catalog, or —
Circle Inform-A-Gram No. B65.

21 Contact Arrangements are described in Bulletin 956 on heavy duty limit switches published by R. B. Denison Mfg. Co., 102 St. Clair Ave., N.W., Cleveland 13. Detailed are the housing, wiring diagrams, ampere ratings, operating data and electrical characteristics of each of the nine standard models of Loxswitch limit switches. Included is a cutaway illustration showing the various features of the switch.
Circle Inform-A-Gram No. B66.

A New, Improved Line of cold chamber die casting machines is described and illustrated in Bulletin 5700 offered by The Hydraulic Press Mfg. Co., Mount Gilead, O. Capacities of the machines range from 200 to 800 tons. A large cutaway view shows the construction features. Specifications, and standard and optional equipment are also covered. The company will fill requests for copies of the bulletin, or —
Circle Inform-A-Gram No. B67.

Hand Tapping, Removing Burrs, Re-Sizing and Clean-Up Salvage Work are handled by Chaso solid adjustable taps. They are designed so that the chasers can be easily adjusted to cut under or oversized threads. Ground thread chasers only are furnished for these taps. Further details are found in Bulletin 115 issued by Chaso Tool Co., Inc., Box 268, North Branch, Mich., or—**Circle Inform-A-Gram No. B68.**

A Complete Line of Carbide Tool and Chip Breaker Grinders is described in Catalog 260 released by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich. New machines covered include Models SCE-6, CBW-6, CM-6W, CM-6 and 14-SWD. Each item is illustrated, described and the features noted. Also given are complete specifications. Obtain copies from the company, or —
Circle Inform-A-Gram No. B69.

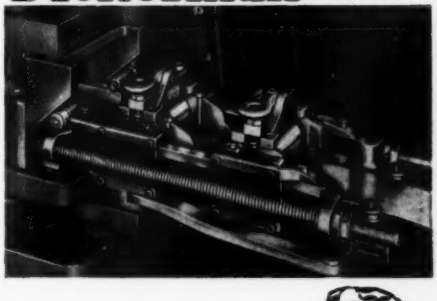
Principles of Operation and advantages of Turks Heads are found in Catalog TH56 released by Fenn Mfg. Co., Fenn Rd., Newington, Conn. Included are details on the outstanding features, specifications, sizes, technical operating data, typical tandem arrangements and accessories. In addition, many typical wire shaping applications are explained. For your copy of the catalog, contact the company, or —
Circle Inform-A-Gram No. B70.

THE BOSS... gains through automation—overall production economy that means more work per day, per dollar.

8 ways to benefit... save... with

Dickerman FEEDS

PRESS ROOM FOREMAN... benefits by speed—Dickerman feeds operate continuously at any speed the tooling in the press will withstand.



PRESS OPERATOR... welcomes simplified operation—Dickerman feeds prevent human fatigue, human error, work indefinitely without downtime.

QUALITY CONTROL MEN... cheer the constant accuracy and uniformity Dickerman feeds bring to any press feeding job.

ASSEMBLY FOREMAN... gains as components flow in steadily—there's never an afternoon letdown, never a production lag.

THE CUSTOMER... is always ahead because deliveries are always on time, always "as specified".

DIE DESIGNERS praise the Dickerman templates that help them engineer Dickerman feeds onto their presses—send for your copies today!

You'll benefit through increased production . . . greater accuracy . . . bigger profits when you install dependable Dickerman Die Feeds, Hitch Feeds®, and Rol-Di-Feeds on your presses.

Dickerman

H. E. DICKERMAN MFG. CO.

321-303 Albany Street, Springfield, Mass.

Send today for complete details on the money-making Dickerman line.

CIRCLE INFORM-A-GRAM KEY NO. 171

PRODUCTS

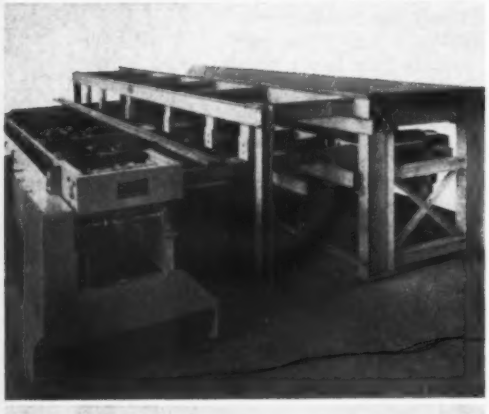
NEW DEVELOPMENTS · IMPROVEMENTS · COST AND TIME SAVERS

NYLON DRILL SLEEVE . .

Eliminate most drill breakage with the Drill Saver, a nylon drill sleeve. The sleeve will break, not the drill, when the drill hits a hard spot or air hole and stops. It is not affected by coolants, oil, gasoline or grease. James Products Co., 801 Mentor Ave., Mentor, O., or — **No. A1.**

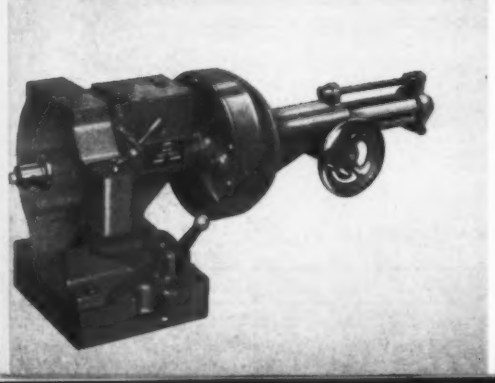
HOLE GAGE . . .

Rapid, highly accurate measurement of small hole diameters is performed by the Kwik-Chek hole gage. Accuracy is 0.0005″. A complete set of three gages covers hole diameters from 0.025″ to 0.380″, each having a range of 0.125″. Hamilton Watch Co., Allied Products Div'n, Lancaster, Pa., or — **No. A2.**



BAR HOPPER FEEDER . . .

The hopper is designed to receive 10,000-lb bundles of 2″ dia x 20′ long round steel bars or tubes. The transfer table transfers them to the V roll conveyor which feeds the bars to the cut-off machine or furnace. The feeder is available for various sizes of bars or tubes. Spurgeon Co., 23501 Hoover Rd., Van Dyke, Mich., or—**No. A3.**



PRECISION BORER . .

With Model C-4 Hydro-Borer, tolerances of ±0.0003″ and finishes to 30 micro-inches are possible. The borer can be mounted on any type of base. Feed is available in two ranges — 0.002″ to 0.004″ and 0.0035″ to 0.007″. Greenlee Bros. & Co., Rockford, Ill., or— **Circle No. A4.**

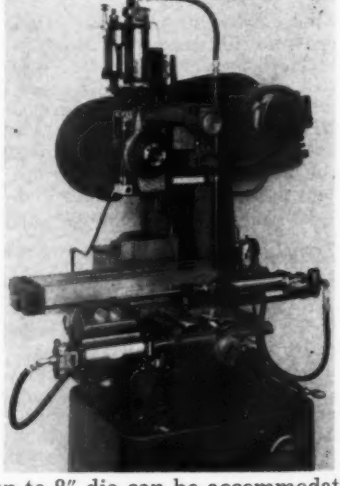
AUTOMATIC POWER FEED ON DRILL PRESS . . .

The Portomag drill press now features automatic power feed. While the electro magnetic base holds the drill press in position, the power feed enables the operator to run the drill point down to the center punch mark, then

turn on the automatic feed and the drill does the work. The power feed can be engaged or disengaged at any time during the drilling operation. The drill press can drill up to 1¼″ and tap 1″ holes with accuracy. Portomag, Inc., 1511 E. 9 Mile Rd., Ferndale 20, or — **Circle No. A5.**

GERMANIUM SLICING MACHINE . . .

This high-speed automatic milling machine has been developed for slicing and dicing Germanium ingots for the transistor manufacturing industry. Diamond impregnated sawing discs



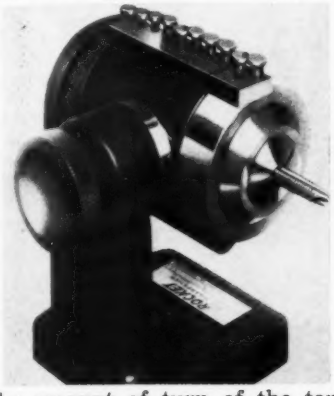
up to 8″ dia can be accommodated. The machine has an automatic transverse feed of 6″. The Robert E. Morris Co., W. Hartford 7, Conn., or — **Circle No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

TAP SHARPENER . . .

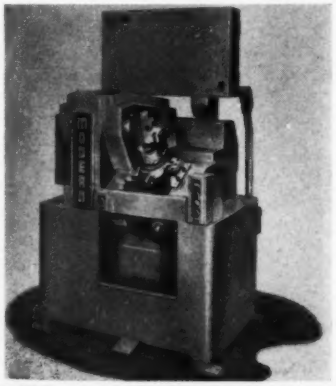
Sharpen 4, 5 and 6 flute taps with new 60 Series Tap Sharpener. It has increased collet capacity with a maximum of 2¼", supplementing the 50 Series. Pushbuttons control the radial relief and provide indexing for



the amount of turn of the tap. The sharpener is designed to sharpen either left or right-hand taps and requires only 45 sec to set up or change taps. Rockford Die & Tool Works, Inc., 1816 — 17th Ave., Rockford, Ill., or — **Circle Inform-A-Gram No. A7.**

DEBURRING AND CHAMFERING MACHINE . . .

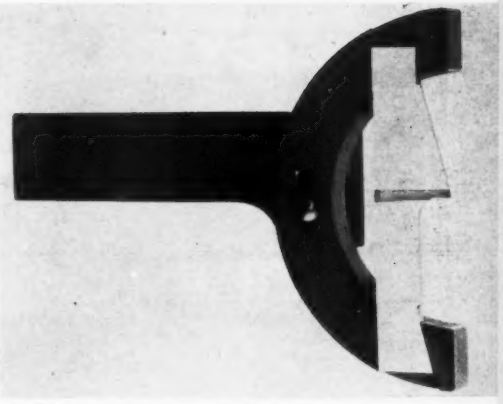
Model BMHP-15 Burrmaster deburrs and chamfers large hypoid pinions. It handles pinions of 8-15 teeth, with an O.D. range of 3¼" to 8" and shaft lengths up



to 15", at production rates up to 280 gears/hr. The machine has a pushbutton controlled, completely automatic machining cycle. Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, or — **Inform-A-Gram A8.**

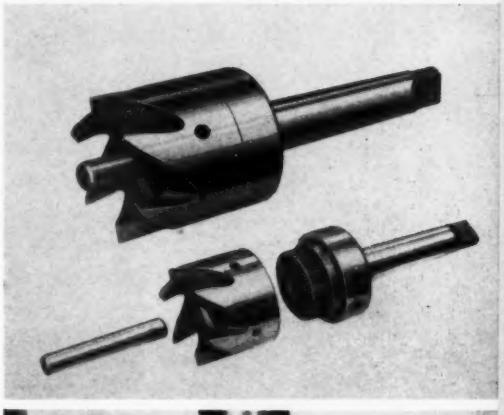
CUT-OFF TOOL . . .

Savings in cutting time, blade replacement costs and power are achieved with the Speedway cut-off tool assembly for lathes and automatic machines. The cutting edge is supported by tension instead of bending moment, eliminating the overhang problem. Wye-Stanley Tool Co., 3503 E. Olympic Blvd., Los Angeles 23, or — **Inform-A-Gram No. A9.**



HOLE-MAKING TOOL . .

Cut holes in thick stock with the Hole-Mill. It produces deep holes in flat, thick plate, or on curved cylindrical pieces and mills through-holes in stock as thick as ¾" in some tool sizes. The tool is made in a range of hole sizes from 1" to 4". Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif., or — **Inform-A-Gram No. A10.**

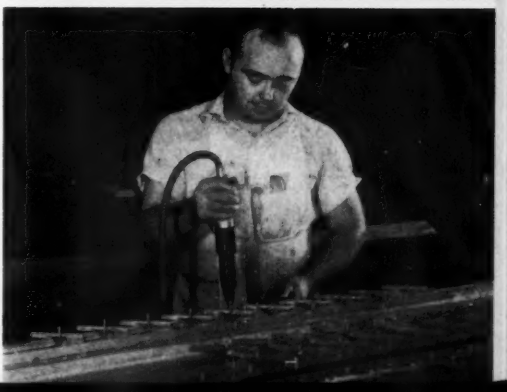


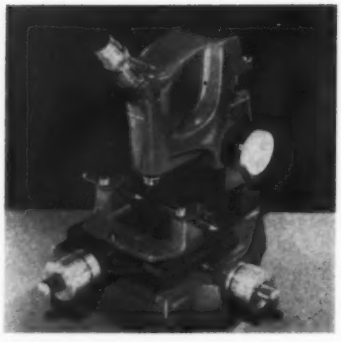
PARALLEL AND V-BLOCK FIXTURE . . .

Support work on drill presses, benches, surface plates, etc., with IMP Mules. They are especially useful when mounting punch plates to punch holders for drilling. The IMP Mules are available in two sizes. Illinois Metal Products, 429 W. Superior St., Chicago, or — **Inform-A-Gram No. A11.**

SCREWDRIVER WITH TORQUE CONTROL . . .

Precision torque control in the assembly of threaded fasteners is possible with a new line of air and electric screwdrivers and nutsetters. The Uni-Tork line features a range of adjustments from 10 to 100-in-lbs torque. Thor Power Tool Co., Aurora, Ill., or— **Inform-A-Gram No. A12.**





Fast, Accurate Measurement of Jigs, templates, tools and all types of finished parts is possible with the Toolmaker's Measuring Microscope. Standard magnification is 35X. Details are found in Catalog D-282 from Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y., or — **Circle Inform-A-Gram No. A13.**

Mix Soluble Oil and Water in one-tenth of the time with a new low-cost device. The Force-Flo mixer consists of a mixing head with an intake for water, an intake for soluble oil, a mixing chamber and a dispensing outlet. Force-Flo., Inc., P.O., Box 2442 E. Cleveland 12, or — **Circle No. A14.**

PRECISION
Machine Tool Attachments
with endless versatile variations
TRAVERSE SLIDES FEEDS TABLES
SPINDLES—MOTORIZED OR BELT DRIVE
FOR WORK HEAD OR GRINDING WHEEL

DO IT YOURSELF!

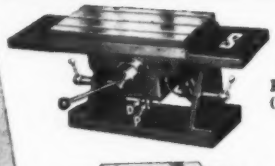
Select a STANDARD Precision Spindle and/or Work Head . . .

Assemble with STANDARD Feeds or Traverse . . .

To convert your old machine tool . . .

To design your own assembly or machine tool . . .

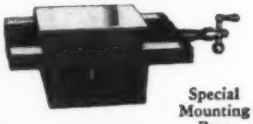
To incorporate in a special machine you wish STANDARD to build for you



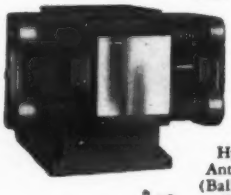
8"x21" Precision (Tilting) Table

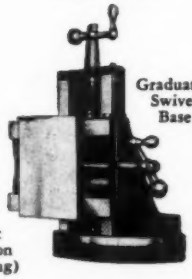
360° Swivel

Compound Feed



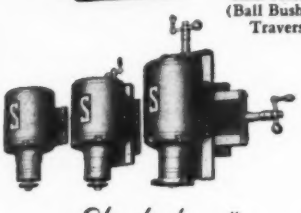
Special Mounting Base





Graduated Swivel Base

Hydraulic Anti-Friction (Ball Bushing) Traverse



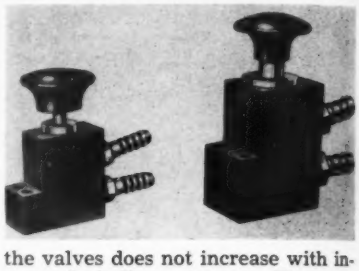
Booth 677
Western Metal Cong. & Expo.
Pan-Pacific Auditorium
Los Angeles
Mar. 25-29

Standardize with *Catalog on Request*

the STANDARD electrical tool co.
MACHINE TOOLS
MT. HOPE & SIXTH STS. • CINCINNATI 4 • OHIO

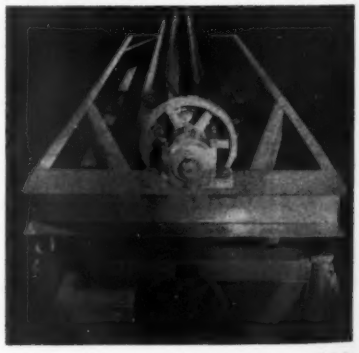
CIRCLE INFORM-A-GRAM KEY NO. 174

Faster, Easier Action is an advantage of two new step valves with larger, more direct air passages. Because of the spool type plunger construction, the effort needed to actuate



the valves does not increase with increased air line pressure. They can be furnished in either spring return or self-locking type, normally closed or normally open. Mead Specialties Co., Dept. SV-93, 4114 N. Knox Ave., Chicago 41, or —
Circle Inform-A-Gram No. A15.

Sand or Polish Wide Metal Sheets with brush-sanding drums ranging from 37" to 74" wide now being manufactured by Merit Products, Culver City, Calif. Their design permits sanding low areas, warps or



sinks without grinding down high spots, achieving a uniform scratch pattern across the entire width and length of the sheet. Shown is a 74" width drum.
Circle Inform-A-Gram No. A16.

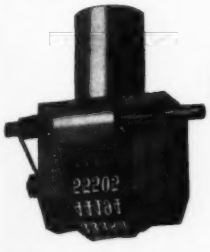
NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

NEW MODEL 70

MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20. Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Write for Bulletin TP-70.

Hand shank Model 70 illustrated. Press shank for foot or power presses also available.



Model 50 Automatic Numbering Head (at left). Write for catalog TP-50.

We also make other numbering heads, non-automatic, with quick-set wheels. Write for catalogs TP-80 and TP-85.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1751

ELIMINATE YOUR PROBLEMS!

COMPLETE DESIGN-AND-BUILD SERVICE.

• Tools, dies, jigs, gages, fixtures or special machinery. We'll work from idea, blueprint or sample part. Complete engineering service, experienced machinists. Prompt quotations.

Also METAL PRODUCTION CAPACITY

• For long or short production runs of large or small parts. Complete facilities including Profilometer Duplicators, Presses up to 450 tons, Planers up to 20 ft. stroke, Radial Drill Presses up to 8 ft., Lathes up to 158" c. c., Boring Mills up to 120" bed, Milling Machines, Grinders, etc.

Inquiries invited on individual or contract basis.

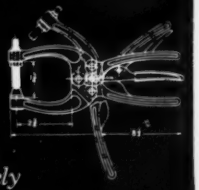
PIVOT PUNCH & DIE CORPORATION
North Tonawanda, N. Y. Phone JA 1200

CIRCLE INFORM-A-GRAM KEY NO. 1752

Have you seen the entirely new Metlfax magazine? If you work in the metalworking industry or if you sell to the metalworking industry you should investigate this new book. . For your copy write Dan Daniels 1975 Lee Road, Cleveland 18, Ohio.

announcing...
TRIGGER-RELEASE levers on 5 more
DE-STA-CO
PORTABLE
TOGGLE CLAMPS

MODEL 462
Trigger-Release levers also available on DE-STA-CO Toggle Clamp Models 461, 462-S, 463, and 463-S (jaw spans ranging from ½" to 3").



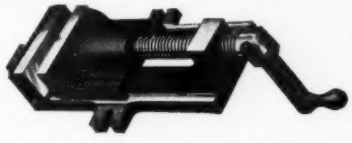
For a one-handed clamping job . . . especially in a hard-to-get-at place . . . there's *nothing, absolutely nothing,* as good as a Trigger-Release DE-STA-CO Portable Clamp! . . . And now, with 5 more new models, we meet practically every such clamping requirement.

FOR COMPLETE INFORMATION, WRITE FOR 40-PAGE CATALOG AND NEAREST DE-STA-CO DEALER!...

DE-STA-CO **DETROIT STAMPING COMPANY**
WORLD'S FIRST LINE OF TOGGLE CLAMPS

344 Midland Avenue • Detroit 3, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1753



Cut Costs!

with the NEW YOST DRILL PRESS VISE

• **Developed expressly for use on drill press operations.**

• **Does away with special and costly jig fixtures.**

• **Available in two sizes:**

No.	Jaw Width	Max. Opening
1D	3½"	4 "
2D	5 "	5½"

Write today for bulletin on the extensive Yost line.

YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa

CIRCLE INFORM-A-GRAM KEY NO. 1754

Mold your own LEAD HAMMERS

COMPLETE LEAD HAMMER SERVICE

Here's the inexpensive, fast way of molding and remolding your own lead hammers with this COOK mold and ladle. It produces hammers that can "take it" Simple to operate.

Write for circular and prices

LAWRENCE H. COOK, INC.
48 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1755

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

Here is the *faster,* more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1756

AIR-MITE

HIGH PRODUCTION AIR PRESS

with more Quality Features

★ Solid Steel Column. Greater strength and rigidity.

★ Brass cylinder, aluminum end castings, Hy-Car piston cups.

★ Accurately ground table.

★ Fast set-up and stroke adjustment.

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity

$89.95

F.O.B. Chicago

New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

AIR-MITE Devices, Inc.

4405A W. KINZIE • CHICAGO, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1761

LAYOUT FLUID

IDEAL FOR METAL PATTERN MAKERS

TRIAL OFFER

Send me my order of D-R LAYOUT FLUID right away! Bill me ☐ Bill my company ☐

Name_____

Company Name_____

Address_____

City_____ Zone_____ State_____

2 FOUR OZ. "BRUSH-IN-CAP" CANS

$1.00

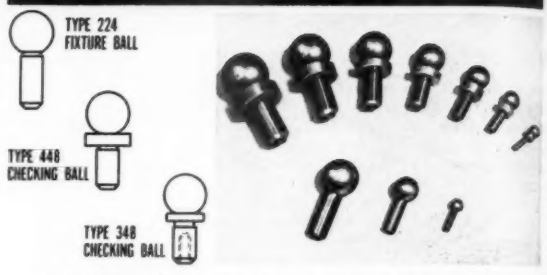
DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1762

High-Precision Stainless Steel

TOOLING BALLS



- For gage, jig and tool work. Center of ball provides positive reference point for work in any plane.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
- Durable; corrosion-resistant. Made of Type 440-C stainless steel, hardened to 55-58 Rockwell C.
- In stock: Types 224 and 448 in 7 ball sizes, ¼" through 1" by ⅛" steps; Type 348 with ½" ball and 6-32 tapped shank. Other sizes to order.

WRITE FOR price list and ASTE Data Sheet.

INDUSTRIAL TECTONICS, Inc.

3691 Jackson Rd., Ann Arbor, Michigan

18323 Santa Fe Ave., Compton, California

PRECISION BALLS OF ANY SIZE OR MATERIAL

ANTI-FRICTION BEARINGS FOR SPECIAL REQUIREMENTS

TOOLING BALLS — MASTER BALLS — SPHERICAL FINISHING

CIRCLE INFORM-A-GRAM KEY NO. 1763

The New SCHERR MICRO-PROJECTOR with the VERTICAL design

NEW 1957 SELF CONTAINED IMPROVED MODEL

FEATURING

✓RIGID FLOOR BASE - ELIMINATING EXTRA CHARGE FOR TABLE

✓TILTING STAGE FOR HELIX, ANGLES AND BEVELS

✓4" DIA. STAGE OPENING

✓COLUMN SLIDE ADJUSTABLE FOR WEAR BY MEANS OF GIBS - WILL HOLD SQUARE INDEFINITELY

✓CUSTOM MADE PRECISION COATED LENSES & DOUBLE CONDENSERS FOR DIFFERENT OBJECTIVES 10 TO 100X MAGNIFICATION.

✓AN ENTIRELY NEW PRACTICAL DESIGNED TOOL FOR INSPECTION DEPARTMENT AND PRODUCTION SHOP.

WRITE FOR ILLUSTRATED FOLDER

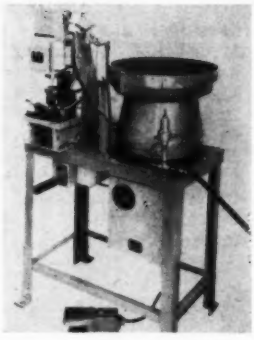
GEO. SCHERR CO., Inc.

COMPLETE LINE OF PRECISION INSTRUMENTS

200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

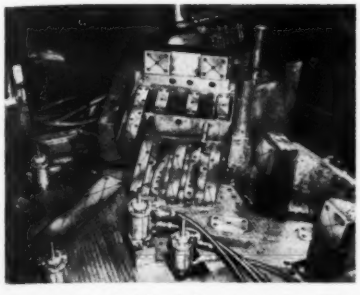
CIRCLE INFORM-A-GRAM KEY NO. 1764

An Automatic Machine has been built for feeding and staking clips. The unit consists of a vibratory part feeder in which clips are oriented and fed to the staking device. As shown, it is adapted to an electro punch unit for depositing and staking the clip to auto window trim. Automatic Methods Inc., 848 W. Grand St., Elizabeth, N. J., or —
Inform-A-Gram No. A17.



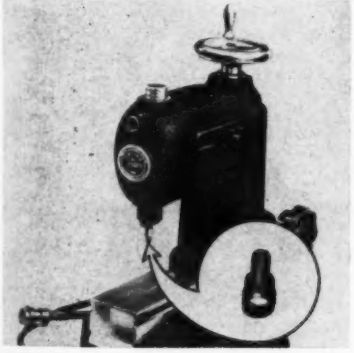
A 10" Throat Capacity is a feature of Model 95 12½-ton hydraulic punch. Punches for this machine can be obtained in rounds, squares, ovals, rectangular or special shapes. This press operated by foot treadle is available as a cabinet (shown) or bench model. W. A. Whitney Mfg. Co., 632 Race St., Rockford, Ill., or—
Inform-A-Gram No. A20.

These Aluminum Bronze Wear Plates are used for dies with cam or sliding action. The lower cost OK Aluminum Bronze Wear Plates can be made to specification or delivered

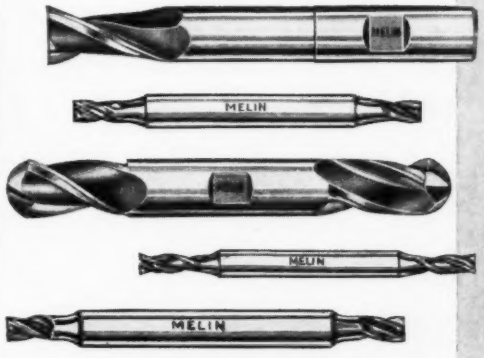


completely finished from stock. The plates are ground to ±0.0005" parallel and flat. The steel base is easily machinable for fitting to dies. The Ohio Knife Co., Dept. LL-55, Cincinnati 23, O., or —
Circle Inform-A-Gram No. A18.

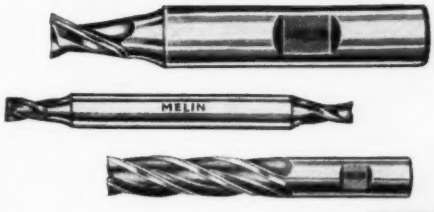
Low Cost Boron Carbide Gage Points for standard and special gages are being manufactured by Robert Marks Co., 47 Goddard St., Providence, R. I. The Norbide gage points



are shown being used on a Brown & Sharpe No. 951 electronic comparator. These points won't pick up dust or become charged. They remain smooth and polished during use and will not scratch work on any metal.
Circle Inform-A-Gram No. A19.



MELIN
END MILLS



There is a difference in end mills . . . MELIN end mills! Proof of this is evident in the continued increase in MELIN popularity. The growth in MELIN tool acceptance was by no means an accident . . . The secret is in *CONSISTENT QUALITY*. This standard of Quality assures you better performance . . . longer lasting performance . . . CONTINUOUSLY . . . from one shipment to another.
Next time you order end mills . . . specify the finest . . . specify MELIN.

MANUFACTURED IN TWO, THREE AND FOUR FLUTE TYPES.

Representatives in principal cities.

MELIN TOOL CO. INC.

MELIN TOOL COMPANY, INC.
3371 West 140th Street
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 177

This 8" Optical Comparator features the principle of vertical beam of light. The workstage is in a horizontal plane and measurements in both dimensions are obtained in natural motions. Leitz optical comparator TP-200 has a quick indexing objective turret for 10x, 20x and 50x magnifications. Opto-Metric Tools, Inc., 137 Varick St., New York 13, or **Inform-A-Gram No. A21.**

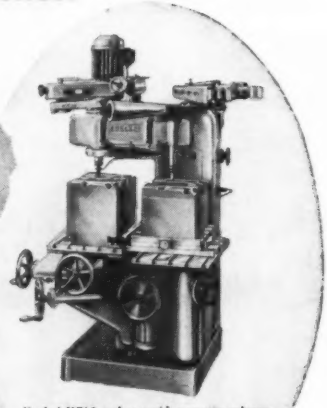
Stamp Lettering or Numbers into Steel Parts with Model 10-T Pneumark impact bench press. Lettering tools use a 1" round shank. Die space is quickly changed by means of a handle at the right side of the column. Geo. T. Schmidt, Inc., 4112 Ravenswood Ave., Chicago 13, or — **Inform-A-Gram No. A22.**

ECONOMICAL, ACCURATE PRODUCTION OF DIES AND MOLDS WITH THE LATEST

DECKEL

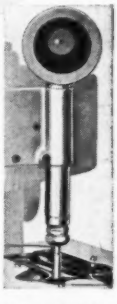
universal pantograph DIE SINKING MACHINE model KF12

Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.

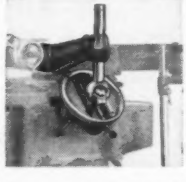


Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15¾" x 15¾" or up to 10" x 19¾".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.



Saddle elevating motor rapidly raises or lowers master and workpiece at the same time.



Circular forming attachment permits generating spherical shapes.

Get in touch with us soon for information on this or other Deckel machines: 2-DIMENSIONAL ENGRAVERS • 3-DIMENSIONAL ENGRAVERS UNIVERSAL MILLERS • UNIVERSAL TOOL & CUTTER GRINDERS

COSA — nationwide sales and service of precision machine tools — from bench lathes to boring mills.

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

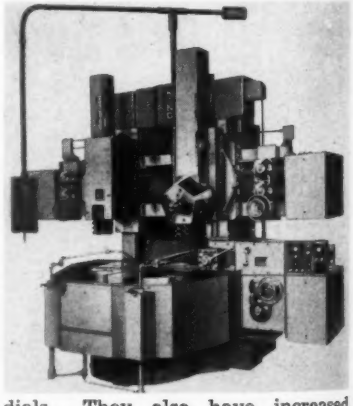
In Canada contact COSA CORPORATION OF CANADA LTD., 1160 Lakeshore Road, Long Branch, Toronto 14, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 178

Magnetically and Automatically Elevate Small Ferrous Parts with the Magna-Mover. Model 31SN12 handles average functions and Model 31SN6 is recommended for heavier ones, since they differ in magnetic

strength. These compact lightweight units are designed to fit into the most congested production line. Belt speed is 85 fpm. For details, see Bulletin B-87-1 provided by Eriez Mfg. Co., Erie 6, Pa., or — **Circle Inform-A-Gram No. A23.**

Higher Accuracy of Work and increased production at lower cost are provided by redesigned King vertical boring and turning machines. These machines are fully electrical in operation. Twenty-four feeds and speeds are pre-selective from direct-reading

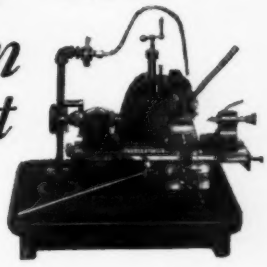


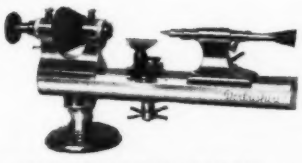
dials. They also have increased horsepower and improved spindle and spindle mounting. The King machines are available in 30", 36", 46", 56", and up sizes in a wide variety of head combinations. American Steel Foundries, King Machine Tool Div'n, 1150-Y Tennessee Ave., Cincinnati 29, O., or — **Circle Inform-A-Gram No. A24.**

Write for full details

Derbyshire *fine precision equipment*

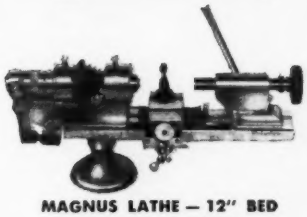
MICROMILL
2 Table Surfaces: 7⅞" x 2⅜" — 12" x 2⅜" — Takes Magnus Collets.



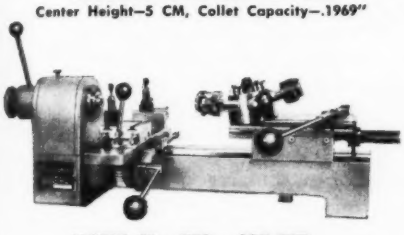


WEBSTER WHITCOMB 12" BED
Center Height—5 CM, Collet Capacity—.1969"

ELECT LATHE — 18" BED
Center Height—2.35" (6 CM)
Chuck Capacity—.004" to .315"



MAGNUS LATHE — 12" BED
Center Height — 5 CM
Collet Capacity — .315"



MODEL No. 750 — 22" BED
Center Height — 7.50 CM, Collet Capacity — .315"

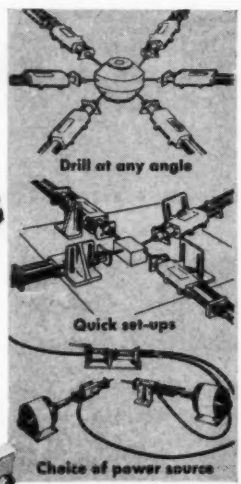
If you have a problem...

. . . concerning small precision turning or milling, one of these lathes or the milling machine shown should solve it. Write for Catalog.

F. W. DERBYSHIRE, INC.
157 HIGH STREET
WALTHAM MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1791

Commander
MULTI-ANGLE DRILL UNIT



- Compact—only 2¾" wide x 10¾" long
- Drills on close centers
- Low cost • Simple, fast set-up

PRICE ONLY $125.00

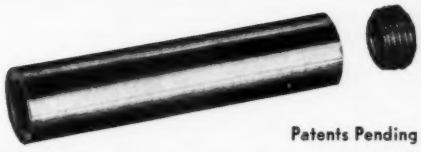
MULTI-ANGLE Drill unit is a complete, compact drill unit that easily adapts to special drilling problems where tooling space is limited. Ideal for angle drilling. Adapts to many power sources—flexible shaft, air or electric motors. Hydraulic spindle actuation—up to 4" stroke.

Write for complete details and name of nearby Commander Distributor

Commander MFG. CO.
4228 W. KINZIE ST., CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1792

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH RD., DETROIT 19, MICH.

Write for Literature

CIRCLE INFORM-A-GRAM KEY NO. 1793

Specify

IDEAL

LIVE CENTERS

Guaranteed to match the accuracy and capacity of your lathe

Widest range of models, load capacities and tapers for every job!

ORDER FROM YOUR IDEAL DISTRIBUTOR OR MAIL COUPON

IDEAL

IDEAL INDUSTRIES, Inc.
1334-C Park Ave., Sycamore, Ill.

Kindly send us data on Ideal's complete line of LIVE CENTERS.

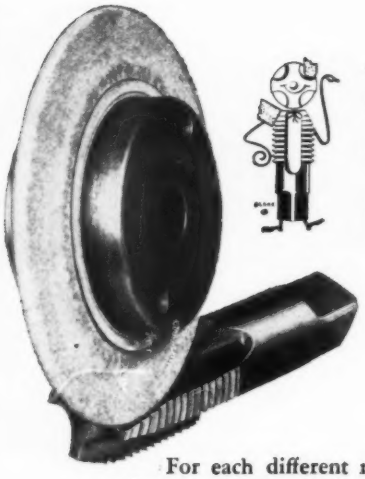
NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 1801



For Profitable Tapping, Grind Your OWN Best Rake Angles!

Controlled grinding of tap flutes and chamfers.

For each different material, there is a "best" rake or hook angle for tapping. You can grind and re-grind this angle on taps for each of your jobs . . . positively and accurately, time after time . . . with the BLAKE Flute Grinder.*

Combined with the BLAKE Chamfer Grinder, this machine can give you substantial savings even with Class 3 or 4 fit standards, because you will have:

1. Best rake or hook angle for the material tapped.
2. Exact indexing of cutting edges.
3. Correct spiral points.
4. Accurately relieved chamfers.

The increased uniformity and accuracy of your threads, plus *far* greater tap life, are the sound basis for maximum savings in your tapping costs.

Ask us for the details of what this combination can do for you.

**Now available with air operated vertical slide.*

EDWARD BLAKE COMPANY INC.

MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS

442 CHERRY ST., WEST NEWTON 65, MASS.

Exclusive Distributors of:
BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDER

CIRCLE INFORM-A-GRAM KEY NO. 1802

REID TOOL ROOM *Accessories*

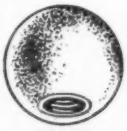
BALL HANDLES — Threaded

ROUND PLASTIC

OB OVAL PLASTIC

OA OVAL PLASTIC

MUSHROOM PLASTIC



ROUND STEEL

Designed for machine tools, jigs, fixtures, shift lever handles etc. and give your product that "dressed-up" appearance. Made in a wide variety of diameters and thread sizes. Round and oval plastic available in red and black. Steel ball handles are turned from bar stock. Highly polished. Low prices and the finest quality.

Also clamping handles, C.I. Hand knobs, Mall. mach. handles, compression springs, hand wheels and many other accessories and components at low prices.

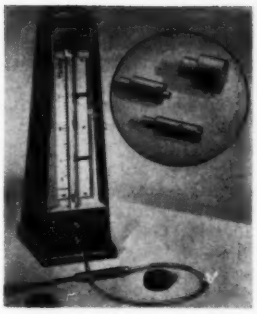
Quality at Moderate Prices!

FREE 64 Page Catalog

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1803

Stock Delivery of Air Gage Spindles for standard air gage instruments regardless of make or model has been initiated by the Air Gage Div'n, Dearborn Gage Co., Dearborn, Mich. Spindles are available in steel, chromium and carbide in through-hole, counterbore and blind types, and in sizes ranging from 0.275" to 3" dia.
Inform-A-Gram No. A25.



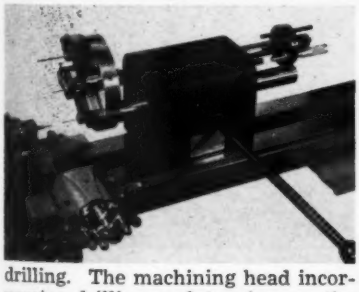
Speed Up Work Involving Heavy Loads on production lines or work station with the Tilt-O-Lift work lift. It gives controlled lifting and positioning by means of a crank balancing hoist. This device will lift a load up to 1½ tons and tilt it at any convenient angle for positioning. Tilt-O-Lift Co., 9510 Belmont, Franklin Park, Ill., or —
Inform-A-Gram No. A29.

Designed for Milling Aluminum and Light Metals Alloys are new straight shank inserted blade end mills. They feature a self-gaging design that minimizes grinding time

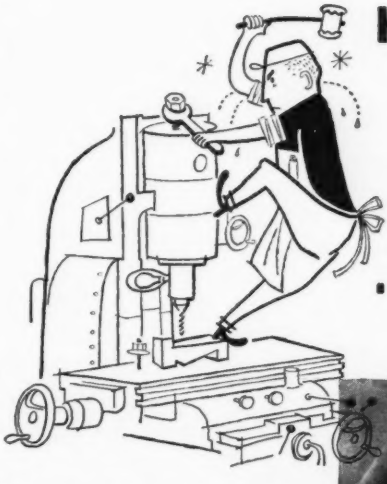
and quick-change diameter adjustments. Nine different sizes are available. Goddard & Goddard Co., 12280 Burt Rd., Detroit 23, or —
Circle Inform-A-Gram No. A26.

A Dry Film Lubricant has been developed for drawing and forming of titanium, titanium alloys, chromium and stainless steels at elevated temperatures. Molykote Type 174X has been used successfully for drawing and forming at 600°F to 1400°F. It can be applied by either spray or brush. The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn., or **Circle Inform-A-Gram No. A27.**

Rough and Finish Diameters in one pass to a ±0.0001" tolerance, from one lathe to another in 20 min for 6" swing and up, with this machining head. Micromatic control eliminates excessive speed in small hole



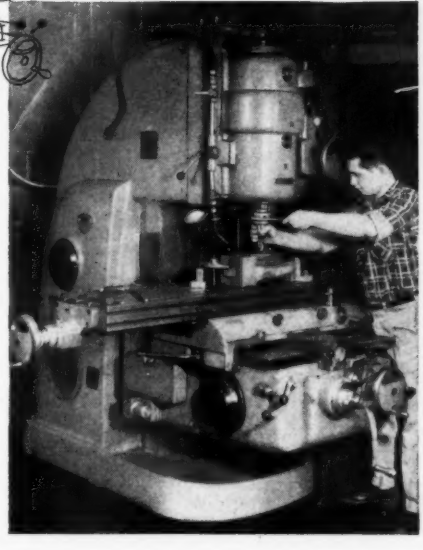
drilling. The machining head incorporates drilling and turning on the same station. Hawkeye Specialty Co., 1532 W. 14th St., Davenport, Ia., or—**Circle Inform-A-Gram No. A28.**



HOW MODERN IS *YOUR* METHOD?

...THIS

... or *THIS*



The modern P.D.Q. tooling method completely eliminates the time lost in changing old fashioned type tools. No more "sweating out" loosening and tightening the draw bolt. A 60° turn of the lock nut and you're ready for another tool. P.D.Q. tool changes are only a matter of *seconds*... and tools are available in very small, small, medium and large series depending on the application. Write for literature covering all the advantages of modern, cost cutting P.D.Q. (Portage Double Quick) tooling.

REPRESENTATIVES IN PRINCIPAL CITIES

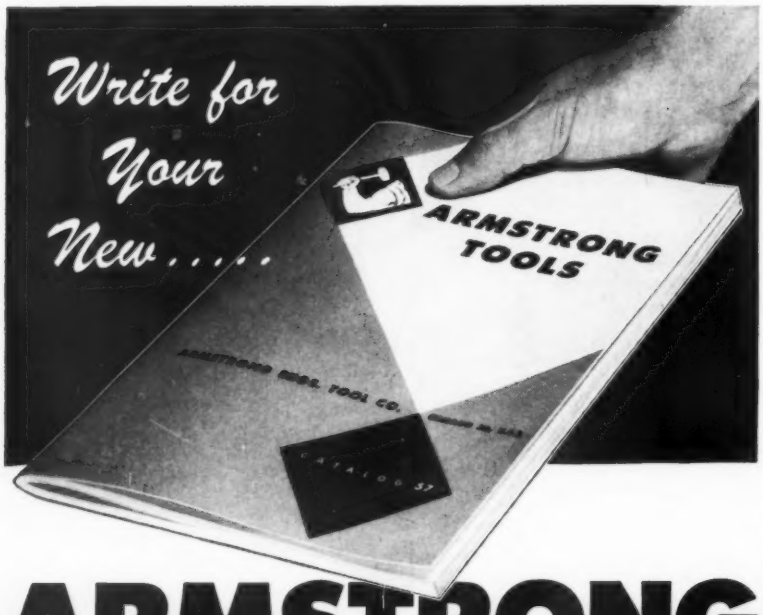
PORTAGE Double-Quick TOOL CO.

1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 181

A New Line of Pressure Regulators has been announced by C. A. Norgren Co., Englewood, Colo. Series 20AG and 20AG-X provides a finer degree of accuracy in air pressure regulation. They feature greater air capacity. In addition, they can be used with water, oil and non-corrosive gases. For full details, see Brochure 566 issued by the company, or — **Inform-A-Gram No. A30.**

Designed for Use on A Surface Plate is a new vertical center. The part being checked is held vertically between centers. It is useful in checking runout on parts with large flanges such as rotors, pump vanes and jet impellors. Capacity between centers is 16". Industrial Gages Inc., 201 N. Madison St., Rockford, Ill., or — **Circle No. A31.**



ARMSTRONG
GENERAL CATALOG NO. 57

Listing approximately 5,000 quality tools for industry, including:

- ★ Tool Holders (The complete Armstrong System)
- ★ Cutting Tools (Tool Bits, Cut-off Blades, Carbide Cutters and Inserts)
- ★ Lathe and Milling Machine Dogs
- ★ Set-up and Hold-down Tools
- ★ Machine Shop Specialties
- ★ Drop Forged "C" Clamps
- ★ Parallel and Machinists' Clamps
- ★ Drop Forged Eye Bolts and Hoist Hooks
- ★ Drop Forged Machine and Crank Handles
- ★ Drop Forged Wrenches
- ★ Detachable Sockets and Drive Parts
- ★ Bridge Ratchets and Sockets
- ★ Adjustable Wrenches
- ★ Torque Wrenches
- ★ Pipe Tools
- ★ Chain Tongs

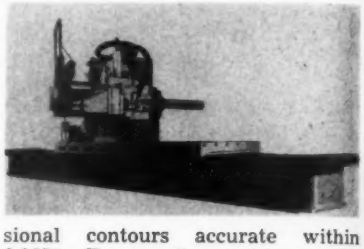
No industry reference file is complete without the new Armstrong No. 57 Tool Catalog

Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO.
5220 W. ARMSTRONG AVE. • CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 182

High Production 360° Profiling, 3-dimensional contouring, and swarf or twist machining can be performed in steel, aluminum or titanium with the new Arrow Profiler. This cutting tool machines profiles or 3-dimen-



sional contours accurate within 0.005". For swarf or twist cuts, the spindle is mounted on arc-shape ways. Spindle speeds range from 37 to 3000 rpm. Arrow Engineering Co., Inc., 120 E. Market St., Indianapolis, or—**Circle Inform-A-Gram No. A32.**

Grinding, Cutting, Carving, Drilling, Sawing, polishing, etc. operations are handled by a power hand tool. The Hi-Torque Handee, Series 6000, features extra speed and power, streamlined design and larger air vents. Weighing 14 oz, it fits in the hand and operates at 25,000 rpm. Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, or — **Circle Inform-A-Gram No. A33.**

With This Precision Cam Generator, any machine shop can lay out and generate its own plate cams in a few hours. The Gen-A-Cam used with either a milling machine or surface grinder makes accurate, constant

rises on all plate cams. It will generate lobes of any size and two or more rates of rise on any one lobe, permitting two or more rates of feed for any tool. Steuby Mfg. Co., St. Louis 13, Mo., or — **Circle No. A34.**

MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$12.75
1	1-13/16	12.75
1¼	2-1/16	13.25
1½	2-7/16	13.25
1¾	2-3/4	16.75
2	3-1/16	19.50

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7 B, MINN.
CIRCLE INFORM-A-GRAM KEY NO. 1831

SMITHS TACHOMETERS

For Precise and Rapid Measurements of

- **Magnetic Design** Steady readings accurate to ±0.5% at any part of any scale.
- **Instantaneous Reading** No timing or waiting.
- **Self-Powered** Needs no battery. Always ready for immediate use at full accuracy.
- **Nine Ranges** To 50,000 rpm on highest. Interpolate tenths of rpm on lowest.
- **Overspeed Protection** Inherent and built-in.
- **Hold Button** "memorizes" reading when desired.

Complete Service Facilities *Send for Details and Literature*

CLARENCE J. MARX CO.

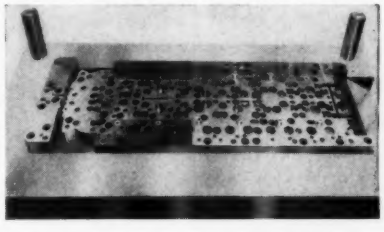
Box 4033, Cleveland 23, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1832

Holes

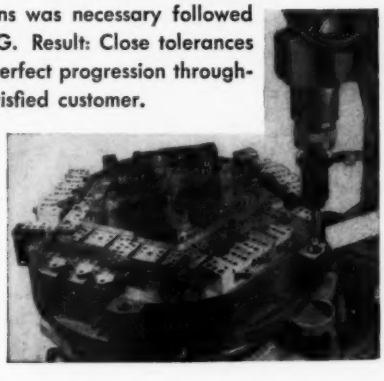
JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



41ST year of Vulcan service.

A seven station die from Vulcan's contract Tool Room. Standard sized punches and buttons were used. But since forming and piercing operations were involved hardening of the sections was necessary followed by JIG GRINDING. Result: Close tolerances held easily and perfect progression throughout — another satisfied customer.



Borrow our instructive 11 minute movie on Jig Grinding.

A five station indexing fixture from Vulcan's contract Tool Room. Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts, and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

Services of YOUR TOOL ROOM in Dayton

Engineering, Processing, Designing . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . . Vulcanaire Grinding Heads . . . Motorized Rotary Tables . . . Plastic Tooling . . . Vulcanaire Jig Grinders.

VULCAN TOOL CO.

741 LORAIN AVE. • DAYTON 10, OHIO

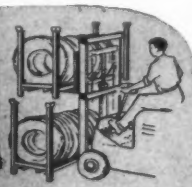
CIRCLE INFORM-A-GRAM KEY NO. 1833

JARKE MODULAR STORAGE SYSTEMS

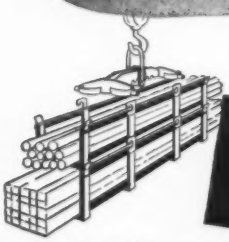
Increase Storage Efficiency
Save Time, Save Labor, Cut Costs

Jarke "Mini-Module" prefabricated storage racks give you storage when you want it, where you want it. Temporary or permanent. Simple to set up or take down, no bolts, no tools, no fittings. Special "nesting" caps provide fast stacking and insure rigid, no-slip interlocking tiers. Lightweight, easy to handle. Sturdy steel construction.

WIRE COIL RACKS



For stacking coiled material. Four-way entry . for fork truck, open ends for ram-type deposit of coils. Nesting caps insure fast easy stacking.



PORTABLE BAR RACKS

For safer stock transport. Unique crane grab permits load centering and rapid fool-proof engagement. Automatic grab also available.

Send for Details on
20-DAY FREE TRIAL OFFER

JARKE MANUFACTURING COMPANY

5407 N. Broadway Chicago 40, Illinois

Manufacturers of Portable Storage Racks, Steelmobile, Scrapmobile

CIRCLE INFORM-A-GRAM KEY NO. 1841

FOR LESS THAN $45 YOU GET 12 SETS, EACH SET GROUND READY TO GO

Men would not accept either idea at first...

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $45 you get a dozen sets of ¾—16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "UNIFIED AND AMERICAN SCREW THREAD DIGEST"

THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1842

Over Fifty Years of Lathe Building Experience

2 NEW C&J LATHES AT YOUR SERVICE!

A fitting climax to over half a century of progressive improvement in every detail of designing, engineering and construction. Worth looking into . . . sure to result in

Fast, Accurate Turning at Lowest Costs

16" VARIABLE SPEED ENGINE AND TOOL ROOM LATHE MODEL VS

Standard taper key drive spindle nose. Heavy duty Precision Timken taper bearings on spindle.
Infinitely variable spindle speeds from 30 to 1500 rpm.

WRITE FOR NEW BULLETIN A56VS

16" GEARED HEAD ENGINE LATHE MODEL GH

12 geared spindle speeds provide enormous pulling power. Choice of threaded or taper key drive spindle nose. Heavy duty Precision Timken taper bearings on spindle.

WRITE FOR NEW BULLETIN A56GH

BOTH LATHES ALSO FEATURE:

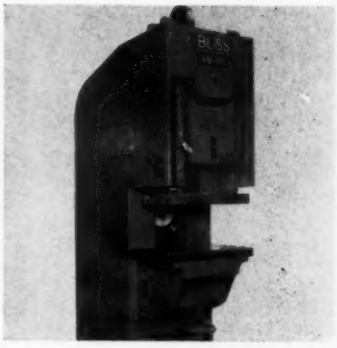
- Separate rod for feed — lead screw for thread chasing only
- Heavy front and rear cabinet legs for maximum rigidity
- Extra length carriage — 23⅛ in.
- Wide range of threads and feeds — 48 separate threads 3 to 184 range
- Separate longitudinal and crossfeed lever controls employing positive type clutches
- Large crossfeed and compound rest dials

THE CARROLL - JAMIESON MACHINE TOOL CO. BATAVIA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1843

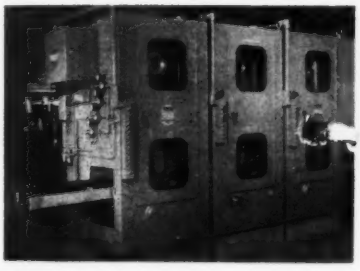
Cooler, Smoother Cutting of non-ferrous metals is possible with a new carbide tipped saw featuring Penta-Cut tooth design. The saw can be machine sharpened with precision since all cutting edges are on the same periphery. No special set-ups are required. Blades are available in 12", 16", 18" and 20" dia. Victory Carbide Saw & Tool Co., 3856 N. Ashland Ave., Chicago 13, or — **Circle No. A35.**

A Fully Enclosed Box Type Frame is a feature of a new line of adjustable bed presses. Shown is a 50-ton press but the line includes capacities from 50 to 150 tons. The presses are suited for a variety of unwieldy stamping and forming work. E. W. Bliss Co., Canton 6, O., or — **Circle No. A39.**



A High Accuracy Remote Position Control has been announced by The Jordan Co., Inc., 3235 W. Hampton Ave., Milwaukee 9. The Dialtrol is used for remote or automatic control of valves, variable speed drives, gates and dampers. Full scale follow-up accuracy of ±⅛ of 1% is standard but precision multi-turn potentiometers can be used to provide accuracies of ½₅ of 1%. The Dialtrol incorporates adjustable anticipation to slow down the control motor as the desired setting is approached. **Circle Inform-A-Gram No. A36.**

High Speed Production Grinding, Polishing and Deburring of coil, strip, bars, blanks, or other component parts are performed by the Straight-O-Matic line of machines. Shown is Model R600C-3 which uses



three abrasive belts over one conveyor belt. This unit provides a three-grit polishing sequence, a three-step stock removal for sizing, or combinations. Curtis Machine Div'n, The Carborundum Co., Jamestown, N. Y., or — **Circle Inform-A-Gram No. A37.**

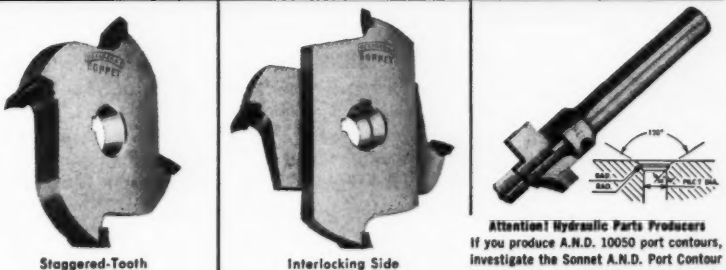
Toolroom Work and Short Production Runs of Parts requiring machining of regular or irregular internal or external contours in single setup are handled by a vertical shaper. Chomienne 5" provides 11½" longitudinal and transverse carriage movements, plus rotary movement through a built-in 12½" rotary table. Ram stroke is adjustable up to 5". Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y., or — **Inform-A-Gram No. A38.**

6 new ways to cut floor-to-floor time!

"Helicarb" milling cutters have a constant included cutting angle. The cutting load is uniformly distributed over the full length of the cutting edge. Cutters stay sharp longer, give far better dimensional control, better finishes, and greater stock removal. On many jobs, rough and finish cuts can be combined. Floor-to-floor time is drastically cut, reducing per-part cost.

These new cutters fully utilize the new advances in machine tool design. More and more shops—those that want a competitive edge—are using them. Why not you?

Shell Mills | End Mills | Slab Mills



Staggered-Tooth Side Mills | Interlocking Side or Straddle Mills

Attention! Hydraulic Parts Producers
If you produce A.N.D. 10050 port contours, investigate the Sonnet A.N.D. Port Contour Cutter that completes five operations in one pass!

HELICARB TRADE MARK

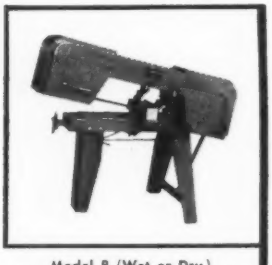
The original line of standard helical carbide milling cutters.

Manufactured by Sonnet Tool & Mfg. Co., 580 No. Prairie Ave., Hawthorne, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 185

Increase Alignment Accuracy and speed setup with a new milling arbor. The design includes a larger end bearing surface and grooved end collar. The grooved outside diameter and larger size of the end collar make it quickly identifiable by touch or eye, reducing operator error when setting up the arbor. Styles A and B are available. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or — **Inform-A-Gram No. A40.**

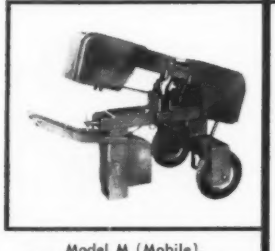
This Automatic Sizing Gage is used for machine control when gaging is done during the processing of parts and for selective sorting. The Deltameter Gage is also used for other control methods where it is desirable to actuate electric circuits for control purposes. Measuring accuracy is ±0.00005". C. E. Johansson Gage Co., Dearborn, Mich., or — **Inform-A-Gram No. A41.**



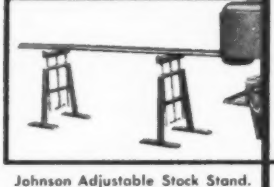
Model B (Wet or Dry) Dependable. Economical. Easily handles 5" rounds, 10" flats.

Johnson

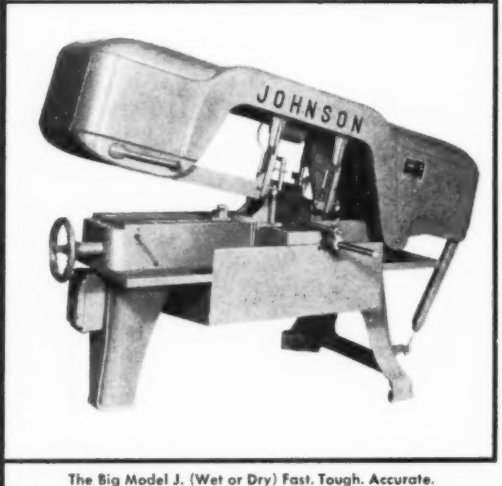
Speaks for itself in ANY SHOP!



Model M (Mobile). Rolls to the job, inside or out. Capacity: 5" x 10"



Johnson Adjustable Stock Stand. Provides rigid, safe work support.



The Big Model J. (Wet or Dry) Fast. Tough. Accurate. Capacity: 10" rounds, 18" flats

The big, dependable Johnson delivers more saw for less money. It easily and accurately handles anything in your stock pile: rods, angles, tubes, heavy rounds, irregular shapes, and flats.

Whatever model fits your production requirements, you'll find Johnson versatility will boost your production and lower your metal cutting costs. Today, the Johnson saw speaks for itself in thousands of progressive shops . . . *why not yours?*

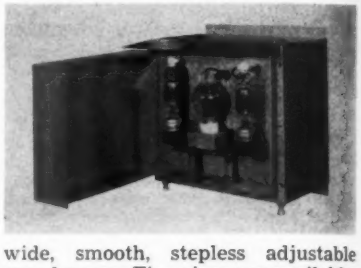
Johnson MANUFACTURING CORPORATION

1015 Barnes Street • Albion, Michigan

Eastern Distributor	*Mid-Western Distributor*	*Western Distributor*
R. J. R. KELLY CO.	W. Q. LUNDMARK	HASTINGS DISTRIBUTORS
Hale Bldg., 51 Main St.	75 N. Broadway	1605 Solano Avenue
East Orange, N. J.	Des Plaines, Ill.	Berkeley, Calif.

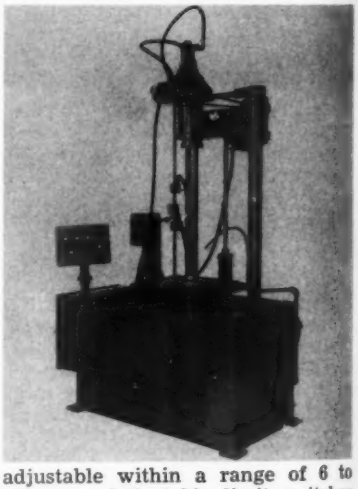
CIRCLE INFORM-A-GRAM KEY NO. 186

Increase The Versatility of Machines with an electronic adjustable speed DC drive designed to give closer speed regulation and to meet minimum space requirements. It provides electronic control of DC motors from AC power, insuring a



wide, smooth, stepless adjustable speed range. Five sizes are available, ¾ hp through 3 hp. No tachometer is required for any size unit. Weltronic Co., 19500 W. 8 Mile Rd., Detroit 19, or — **Circle No. A42.**

A Capacity Up To 4" Dia and 12" in Height is a feature of a vertical type production honing machine. Model VA has a honing cycle that is controlled by an electronic timer and



adjustable within a range of 6 to 120 sec. Adjustable limit switches control and set stroking lengths. Superior Hone Corp., 1619 Elreno St., Elkhart, Ind., or — **Circle Inform-A-Gram No. A43.**

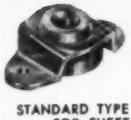
ANCHOR BUSHING DRILL TEMPLATES HOLD DOWN TOOLING COSTS ON THE *Ag-2*

Manufacturing costs are closely watched on Transland Company's new, production designed Ag-2 agricultural and forestry airplane.

Inexpensive, lightweight, Anchor Bushing drill templates provide low cost drill tooling for the complete interchangeability of parts for production and spares for the Ag-2's service program.

Photo shows an easy-to-make Anchor Bushing drill template being used to locate and drill holes for Blind Nuts in the six fuel and liquid wing tank bays and matching holes in interchangeable tank covers.

Write for the Anchor Bushing Catalog for descriptions of Anchor Bushings and shop proven methods for making low cost sheet metal and plastic drill tooling.



STANDARD TYPE FOR SHEET METAL TEMPLATES

CIRCLE TYPE FOR LAMINATE PLASTIC TEMPLATES

U. S. PATENT 2483686
FOREIGN PATENTS PENDING
TRADEMARK REGISTERED

hi-shear RIVET TOOL COMPANY
2600 WEST 247TH STREET • TORRANCE, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1871

✓✓✓ Check these *3 Comet* 'TIPS' for Precision Boring, Facing and Internal Threading

MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

✓ BORING TOOL
- FAST PERFORMANCE
- ECONOMY IN PRODUCTION
- EFFICIENT IN RESULTS

Cutting Edges are lapped for better "Bores" and faster Feeds.

✓ FACING TOOL
- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

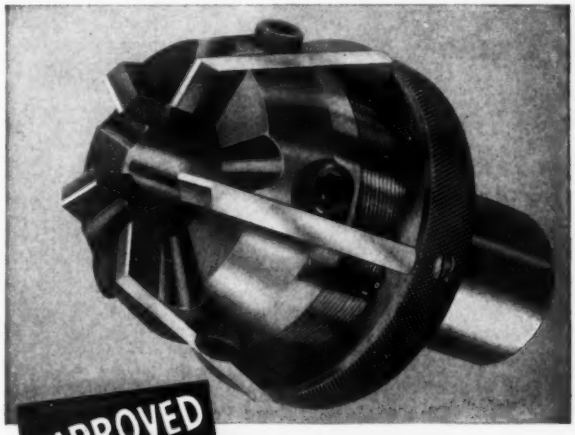
✓ INTERNAL THREADING TOOL
- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE

Dealers! Here's a Profit-Maker!

Write For Complete Data

COMET Tool Co.
738-T Broadway
New York 3, New York

CIRCLE INFORM-A-GRAM KEY NO. 1872



IMPROVED

GENESEE
Adjustable Hollow Mill

There is a size and style Genesee for every hollow milling job. Standard sizes from 0 to 2", standard with straight or Morse Taper shanks carried in stock.

- Quick — easy adjustment
- Simple sharpening method
- High speed steel—cast-alloy —Carbide tipped blades
- Let our Engineering Department solve your Production tool problems

WRITE FOR CATALOG 55P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools

CIRCLE INFORM-A-GRAM KEY NO. 1873

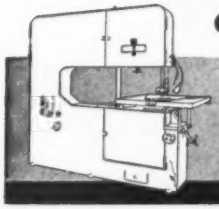
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

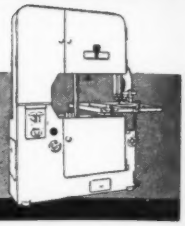
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS

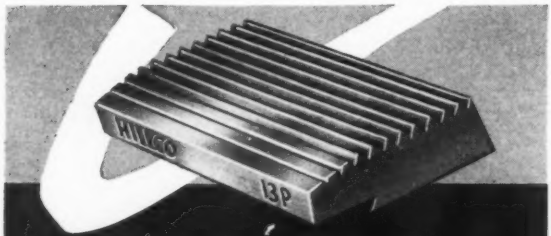
GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1881



"HILLCO" TANGENT CHASERS

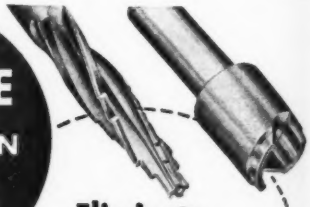
A NEW NAME FOR AN OLD ESTABLISHED PRODUCT

In the interests of standardization the line of ACME Tangent Chasers have been modified slightly in dimensions so that they now are adaptable to other makes of die heads in addition to ACME die heads. This complete line of tangent chasers is now known as "HILLCO". "HILLCO" tangent chasers can be reground for 80% of their original length. The same precision and long wear are guaranteed that have made our chasers a standard through 75 years of cutting tool manufacture.

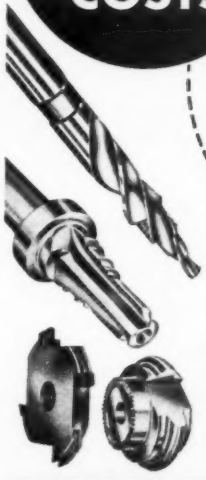
THE HILL ACME COMPANY
ACME MACHINERY DIVISION
1203 West 65th Street • Cleveland 2, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1882

REDUCE PRODUCTION COSTS



Eliminate Extra Operations —Use Spiral's "Multiple-Operation" Step Tools



Carbide and High Speed

Step drills, step reamers, milling cutters, seating and grooving tools, trepanning tools, form tools, carbide and high speed, made to your specs or designed by our engineers to fit your needs. Form ground with "radial relief" gives up to 500% more tool life, imparts smoother finishes on piece parts. Send for details.

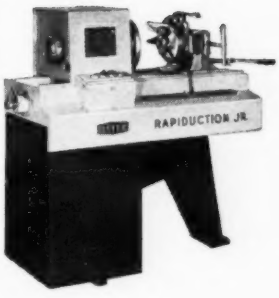
SPIRAL STEP TOOL COMPANY

Designers and Manufacturers of All Types of Special Cutting Tools

5200 N. Damen Avenue • Chicago 25, Illinois
Phone: LOngbeach 1-5384

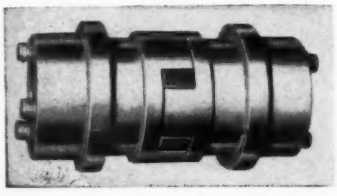
CIRCLE INFORM-A-GRAM KEY NO. 1883

A New Line of Threading Machines is being offered by The Oster Mfg. Co., Wickliffe, O. The Rapiduction Jr. line is made up of four machines of the same basic design, each with different types of die heads and workholders. Drive motors are 3 hp, 1800 rpm with four speed transmissions providing correct spindle speeds for threading the various sizes in the range. **Inform-A-Gram No. A44.**



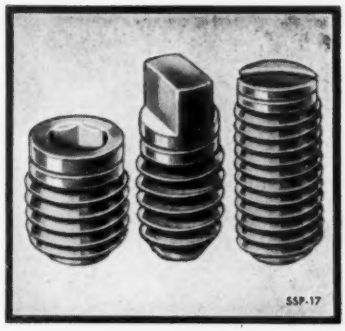
Designed Specifically for Use with Carbon Dioxide is a complete semi-automatic hand gun welding process developed by the Welding Products Div'n, A. O. Smith Corp., Box 584, Milwaukee 1. The C-Omanual process offers the welding speed advantages of fully-automatic operation without the related high jig fixture tooling costs. It features wire speeds up to 600 ipm. This process provides deep penetration and high metal deposits with sound quality and high strength and ductility characteristics.
Circle Inform-A-Gram No. A45.

Easy Disassembly of Connected Machinery is possible with a radially removable flexible coupling. Type RRL is ideal for applications where driven equipment must be disconnected while the driving unit continues to operate. Horsepower ratings range from 7.5 to 40 at 1800 rpm. Maximum bores range from 1⅜" to 2¼" with maximum O.D.'s from 2-9/16" to 5". Lovejoy Flexible Coupling Co., 4979 W. Lake St., Chicago 44, or —
Circle Inform-A-Gram No. A46.



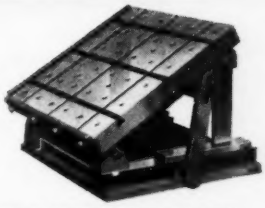
A Non-Marking, Soft-Faced Aluminum Machinists Hammer has been produced by Eclipse Pattern Works, 31 Elberta Rd., Painesville, O. The aluminum will not chip, mushroom, harden or shear, and the Hefty Hammer can be dressed many times. It can be used in automotive and aeronautical production, for positioning heavy dies, driving gear arbors or opening and closing jigs. The Hefty Hammer is available in soft and super soft aluminum and in eight sizes.
Circle Inform-A-Gram No. A47.

Eliminate the Need for Precise Tapping with a new self-locking set screw. With the Crest-Lok, the amount of locking action can be controlled by changing the tap drill diameter. Repeated reuse doesn't affect the locking action. Set Screw & Mfg. Co., Bartlett, Ill., or **Circle No. A48.**



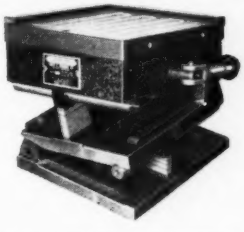
Robbins ...THE COMPLETE LINE OF ANGULAR TOOLING EQUIPMENT

Save dollars in valuable tool room time on every job! Set-ups that require hours by other methods take minutes the Robbins way. Just four simple steps: (1) Look up required angle in Table of Constants furnished with each tool, (2) Select gage blocks from the Table, (3) Place gage blocks between base of unit and sine bar swivel block, (4) Secure the work . . . and you're ready to go! Complete range of models and sizes brings Robbins precision equipment within the reach of every shop, large or small.



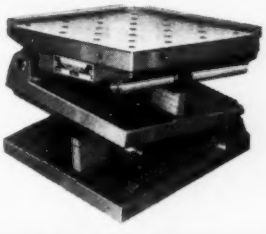
HEAVY DUTY SINE PLATES FOR MILLING AND BORING

Fool proof! Rugged enough to take thrust and chatter of heavy cuts . . . yet built to tool room accuracy for the most exacting inspection operations.



"MAGNA-SINE" MAGNETIC TABLES FOR PRECISION GRINDING

Set up and grind any single or compound angle fast! Work is held securely by magnetic attraction, clamped or released in an instant. Work can't warp or move.



INSPECTION SINE PLATE FOR EVERY INSPECTION OPERATION

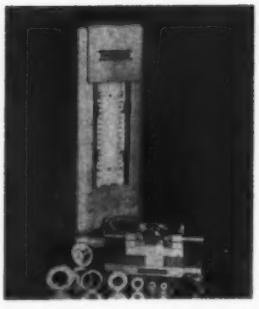
Eliminate chance of errors in inspection department and tool room! No more V-blocks, angle plates, or complicated built-up sets of blocks. Simple, fast and sure.

Write or call for complete information now!

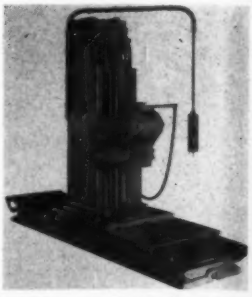
OMER E. Robbins COMPANY
24800 PLYMOUTH ROAD DEPT. C DETROIT 39, MICH.
Also manufacturers of special machinery, automatic assembly machinery.

CIRCLE INFORM-A-GRAM KEY NO. 189

Designed for Inspecting Bearing Assemblies is the Precisionaire Pneumatic Gage. It can also be used on other applications where an adjustable I.D. and O.D. check is desired. Interchangeable spindles and backstops are used for different bore sizes while the O.D. check is adjustable through the 2" size range. The gage comes with 14 sets of tooling. The Sheffield Corp., Div. 610, Dayton 1, O., or — **Inform-A-Gram No. A49.**



Mill Ends of Structural Steel Shapes and perform other cumbersome milling jobs using a pendant-controlled milling machine. This floor type milling machine cuts at a surface speed of about 1000 fpm and feeds 60 ipm using throw-away type carbide cutters. The machine features a wide range of horizontal and vertical travels. The Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, or—**Circle No. A50.**



GET GREATER GRINDER PRODUCTION
BETTER SURFACE FINISHES
LOWER PRODUCTION COST

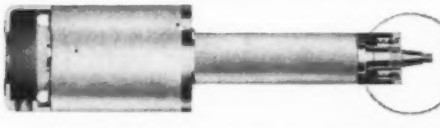
From all your Surface Grinders, new or old

Specify POPE HEAVY DUTY, MOTORIZED SPINDLES

POPE 1, 2 and 3 HP, 1800 or 3600 RPM Surface Grinder Spindles:

- assure continuous production of accurate parts.
- revolve accurately under the heaviest loads.
- permanently lubricated (Pope System) for the life of the bearings.
- have the rigidity to support diamond wheels and to produce more good work.
- have the extra rigidity for crush dressing and form grinding.

WRITE FOR PRICE AND DELIVERY.



LOOK AT THE BEARINGS! permanently preloaded

These super-precision, double row cylindrical roller bearings have the capacity to assure smooth, chatter-free operation over a long life — give the Spindle the ability to rough off surplus metal fast but maintain its inbuilt precision for producing fine finishes.

Separate super-precision ball thrust bearings eliminate endwise movement of the shaft in either direction.

No. 117

POPE® ENGINEERS AND BUILDS STANDARD AND SPECIAL PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

POPE MACHINERY CORPORATION · 261 RIVER STREET · HAVERHILL, MASS.

Established 1920

CIRCLE INFORM-A-GRAM KEY NO. 190

Improve The Finish of Machined Pieces and cut production costs by using an all-purpose anti-friction compound. Mixed with cutting oils or emulsions, Lubikold adds 30 to 50% to the life of tools or dies, and permits faster, deeper cutting without excessive heat. It helps lubricate even after oils or greases have been dispelled by heat. Lubikold Co., 516 Bergen St., Brooklyn 17, or — **Inform-A-Gram No. A51.**

Cooler High Speed Machining and metal drawing and forming operations are possible using the Jet-Mist Generator. It can be mounted on all types of machine tools for applying air-liquid coolants or air-oil lubricants directly to the cutting

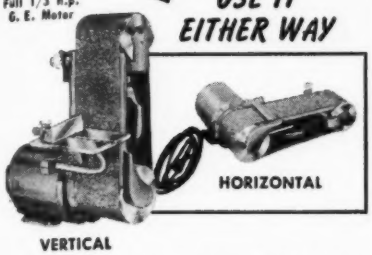
area. The Jet-Mist Generator is used for permanent grinding, turning, boring, milling, sawing, drilling and tapping operations as well as for medium and short production runs. For details, see Bulletin MG-1056 issued by Arrow Tools, Inc., 1928 S. Kostner Ave., Chicago 23, or — **Circle Inform-A-Gram No. A52.**

Designed for Light and Non-Ferrous Metals are the two new bench type welders which have been added to the line produced by Weldex, Inc., 18394 Weaver St., Detroit 28. These air-operated 5 and 10-KVA spot or projection welders feature valve and speed controls mounted at the cylinder for easy access and greater speed. They have a ram bearing surface of 15 sq in at full stroke. **Circle Inform-A-Gram No. A53.**

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor



VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1911

PREPARES COIL STOCK FOR PRESS

New Low Cost
LIGHT-DUTY OILER-STRAIGHTENER
$95.00
Handles stock up to 3" wide, 1/16" (app.) thick

Write for details

JACO DEVICES, INC.
96 High St., Hingham, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1912

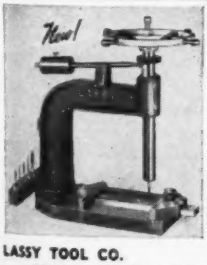
Magnetic Base Indicator holders

Erick
Magna Holder
Model 200B
Only $6.50

See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.

CULLEN MFG. CO., RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1913



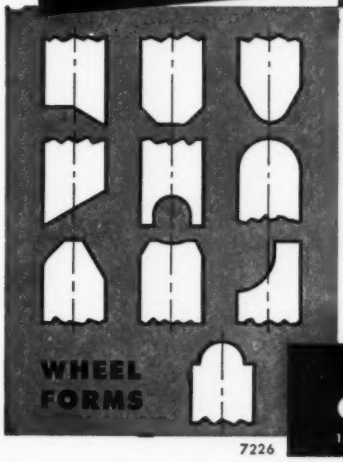
LASSY
SUPERSENSITIVE HAND TAPPER

New exclusive features and top quality make Lassy Tappers outstandingly the finest available. Write for illustrated circular showing 3 models, and also Universal Tap and Die Guide.

LASSY TOOL CO. Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1914

Precision Dress Grinding Wheels to ANY FORM IN 1/4 THE USUAL TIME



The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

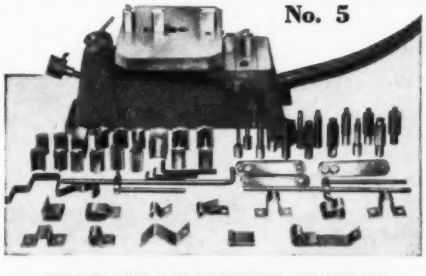
Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

Write for Descriptive Bulletin

PERFEX

PERFEX GAGE & TOOL CO.
123 AVERY ST. • MT. CLEMENS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1915



Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to 1/8"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

WRITE FOR DESCRIPTIVE CIRCULAR

ALSO AIR OPERATED MODELS

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1916

HARDENED and GROUND HSS BLANKS

Any decimal diameter — any length. Mirror finish surface to gage tolerance.

Many uses —

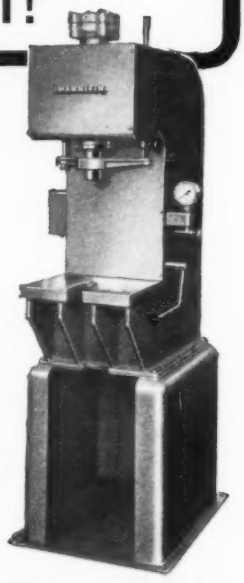
—core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

Write or phone DRexell 6-4223 for price list D-3

WILLIAM T. HUTCHINSON CO.
53 Brown Ave., Springfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1917

"BEST $1530 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 563 S. Wolf Road, Des Plaines, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1921

most **VERSATILE PIN GAGES** *made!*

Horberg exclusive taper feature lets you check undersize, oversize and odd-size holes, slots, etc., quickly and accurately with standard letter, number or drill-size gages.

A precision concentric taper on the lower half of each gage runs to 0.0012" smaller than gage size. You get a continuously accurate range of measurement with each gage, for quicker, handier, precision gaging in set-up, machining, tooling and inspection operations.

SPECIFICATIONS

Diameter accurate to +0.0001" —0.0000"
Standard 1.5" length
Concentric taper on lower half to .0012" smaller size
Oil hardened tool steel

PRICES AND ORDER FORM (F.O.B. Bridgeport, Conn.)

_____Letter sets—52 gages A-Z in pairs $65.00
_____Fraction sets—60 gages 3/64" to 1/2" in pairs $75.00
_____Number sets—120 gages 1-60 in pairs $130.00
_____Single gages_____size ea. $1.50

Sets furnished in indexed plastic case. Extra case $15.00
Prices subject to change without notice.

Please rush items checked to:

Name_____

Company_____

Address_____

Horberg GAGE COMPANY 29 Staples St., Bridgeport, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1922

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings,

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery, Sheet Metal Stampings and Assemblies.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio.
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

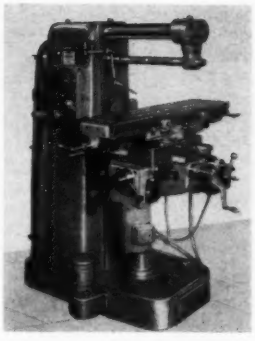
A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.

Pennsylvania

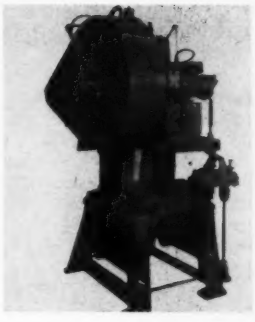
MEDAL MANUFACTURING CO.
328 Vine St., Sharon, Pa. Machined parts, complete machine assemblies, special machinery. Send us your prints for quotes.

Buy U. S. Savings Bonds TODAY!

This Geared Head Horizontal Milling Machine is available in both plain and universal types. Hero Model 1C is equipped with 12 spindle speeds from 35.5 to 1400 rpm. The table of the universal model can be swivelled 45°, left or right. Pushbuttons are within easy range of the operator. Morey Machinery Co., 383 Lafayette St., New York 3, or — **Inform-A-Gram No. A54.**



Press-Rite Presses are now available with either right or left hand flywheel mounting. The left hand flywheel cuts down on the space for working on the automatic feed and there is more flexibility in arranging for manual and automatic feed. It is available on all air clutch models 10 ton and larger. Sales Service Machine Tool Co., Press-Rite Div'n, 2363 University Ave., St. Paul, Minn., or — **Inform-A-Gram No. A58.**



Easier, Faster Setting and Reading; greater rigidity; and longer life are features of No. 123 Master-Vernier Caliper. The long 50-division Vernier scales have widely spaced, easy-to-read graduations. The tool is designed with both Vernier plates fitting flush with the main scale,

eliminating reading errors due to parallax. Both the inside and outside Vernier scales are placed on the same side of the tool so that the caliper is held and read exactly the same for inside and outside measurements. The L. S. Starrett Co., Athol, Mass., or—**Circle Inform-A-Gram No. A55.**

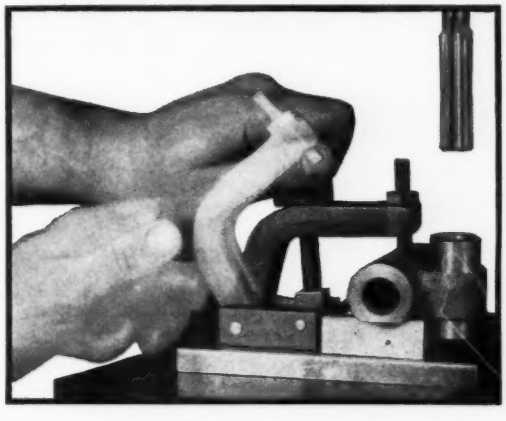
Cut or Grind Aluminum without stain or discoloration using a straight oil compound, International Compound 1231-A. This stain-free coolant possesses excellent lubrication properties which protect both the work and moving parts of the machine. It penetrates to the point of contact swiftly and prevents premature loading of grinding dust on the wheel. International Chemical Co., Dept. 387, 2628 N. Mascher St., Philadelphia 33, or — **Circle Inform-A-Gram No. A56.**

Accurately Locate Blueprint Coordinates of the Workpiece with a new center-find device. The Wiggler is a one-piece battery-powered unit that fits into a lathe chuck, drill press, jig bore, or other machine.

An electrical contact lights a bulb continuously when the work is properly positioned. Armand Products, Inc., 20 W. Morrill Ave., Columbus, O., or — **Inform-A-Gram No. A57.**

Fast and Sure Clamping
LODDING Retracting Clamps

Air automation, too—as fast as your air line—absolutely rigid—self retracting



As quick as your hand, a quarter turn of the screw—one movement of your arm—and your Lodding Clamp is at work. Another simple movement releases work and retracts Clamp. Here is complete surety and quick action—a time and cost saver. Four sizes each of four styles. Hand knob, cam or nut.

Block Adaptor

Round Adaptor

Mounting holes for easy adaptor installation

Factory Warehouses

Precision Tool Sales, 417 E. Florence Ave.
Los Angeles 3 — PL 3-3321

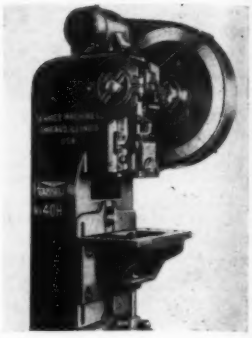
Bagby Engineering Co., 1047 Forest Ave., Evanston, Ill.

LODDING, Inc., Worcester 1, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 193

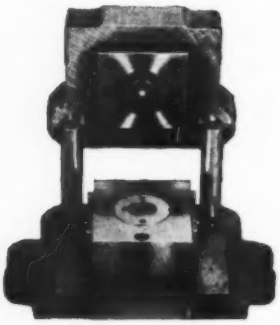
Cut Mild, Stainless and Hardened Steel up to ¼" thick with the new Connecticut Band Saw. It features friction cut which is faster than any other method, producing smooth, accurate edges with a minimum of burr and elimination of distortion from shearing and the roughness and slag of flame cutting. It is available in three models. W. Whitney Stueck, Inc., Old Saybrook, Conn., or — **Inform-A-Gram No. A59.**

Horning Operations such as the forming, punching and riveting of hollow, odd shaped or cylindrical work are handled by a 40-ton horn press. Model 40-H Rousselle Press has an adjustable bed table to accommodate dies and fixtures requiring large die space between the bed and slide. Service Machine Co., 2310 W. 78th St., Chicago 20, will provide detailed information on the press, or — **Circle No. A60.**



"HOVIS WASHER DIES have sure solved our troubles!

"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



Made in 5 sizes:
¾"- 1½"- 2½"- 4"- 6"
Write for Literature

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

The modern method adopted by manufacturers nationally . . . These *Patented* Dies provide a Master Holder by which, upon simply and quickly removing and replacing Five, Small Interchangeable Parts, a new size washer may be produced . . . Special sets of parts available for use in these units . . . This method makes possible production of irregularly shaped pieces and shallow draws . . . Multi-Washer Dies designed and manufactured.

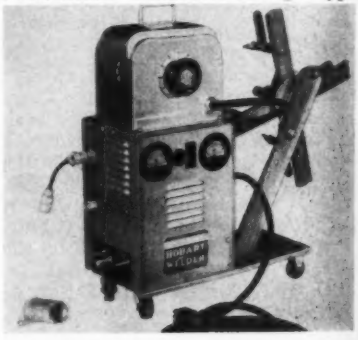
HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD — Phone: Slocum 7-4800
VAN DYKE, MICHIGAN — Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 194

A New Hydraulic and Pneumatic Pressure Switch operates from 0 to 1200 psi and will withstand pressure as high as 3000 psi without distorting its pressure element. It is adjustable over its entire pressure range and adjustments can be made without interfering with the pressure element. The totally enclosed switch can be arranged for wall or bracket mounting in any position. Alloy Bellows Engineering Co., 18125 Roseland Rd., Cleveland 12, or — **Circle Inform-A-Gram No. A61.**

Versatility and Economy in CO_2 and Inert-Gas Metal-Arc Welding are provided by this semi-automatic welding unit. The MIG welding unit is designed for use with Hobart Powromatic constant voltage type

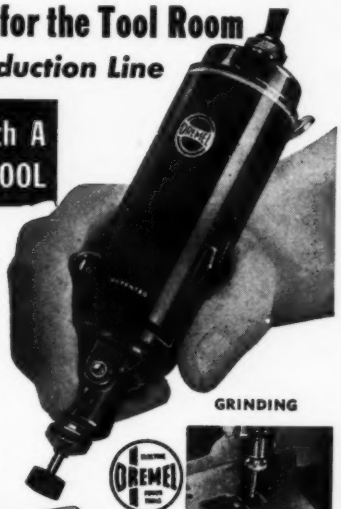


welder, but will operate with any constant voltage type d-c power source. Both wire feed speed and arc voltage are controlled at the work. Hobart Bros. Co., Troy, O., or **Circle Inform-A-Gram No. A62.**

Simplify Marking, Light Piercing, staking and riveting with a new impact tool attachment for use on drill presses, special machines, arbor presses, etc. The Impact-Tool can be mounted at any angle and operates on line pressure as low as 20 lbs. It can be actuated electrically by solenoid or manually by poppet valve. The Impact-Tool has only one moving part assuring trouble-free operation. Air Impac Co., 920 Walnut, Flint 1, Mich., or — **Circle Inform-A-Gram No. A63.**

TIME SAVERS for the Tool Room
. . and the Production Line

Do It Faster With A DREMEL MOTO-TOOL



With DREMEL you can polish, grind, de-burr, sharpen without tearing down set-ups. Moto-Tool is the fastest, most powerful tool in its class. Easy to use as a pencil (dynamically balanced and weighs only 13 oz.). Put the DREMEL to work. See how it pays off in speed, convenience and time savings!

APPROXIMATELY 27,000 R.P.M.

MOTO-TOOL NO. 2, with one emery wheel point $17.85

MOTO-TOOL KIT NO. 2, with 23 accessories (high speed steel cutters) and Model 2 Moto-Tool in sturdy steel case $25.95

GRINDING

SHARPENING

DE-BURRING

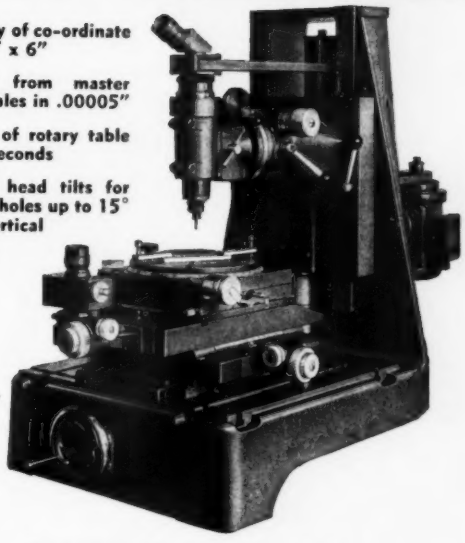
See Your Industrial Distributor or write for catalog.

DREMEL MFG. CO., Dept. 752C, RACINE, WISC.

CIRCLE INFORM-A-GRAM KEY NO. 1951

Leitz OPTICAL JIG BORER

- Capacity of co-ordinate table 6" x 6"
- Setting from master glass scales in .00005"
- Setting of rotary table in 10 seconds
- Spindle head tilts for oblique holes up to 15° from vertical



Request new 8-page catalog 82-4T

OPTO-METRIC TOOLS, INC.
137 TP VARICK STREET, NEW YORK 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1953

FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. TE-3, 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1952

Actual overall length horizontal models: 3½", 5", 6".

"ADJUSTABLE STROKE" MIDGET Air-Clamp® CYLINDER

®TRADEMARK

Now—put pressure where it's wanted instantly and cheaply, with Mead's powerful new midget air cylinders (1" bore, single-acting, spring return—horizontal and vertical). Stroke is adjustable. Cut costs—use 'em singly or in groups to move, hold, press or eject small work pieces; to close and open large jigs, forms, fixtures. They'll replace human fingers and mechanical clamps in countless routine jobs.

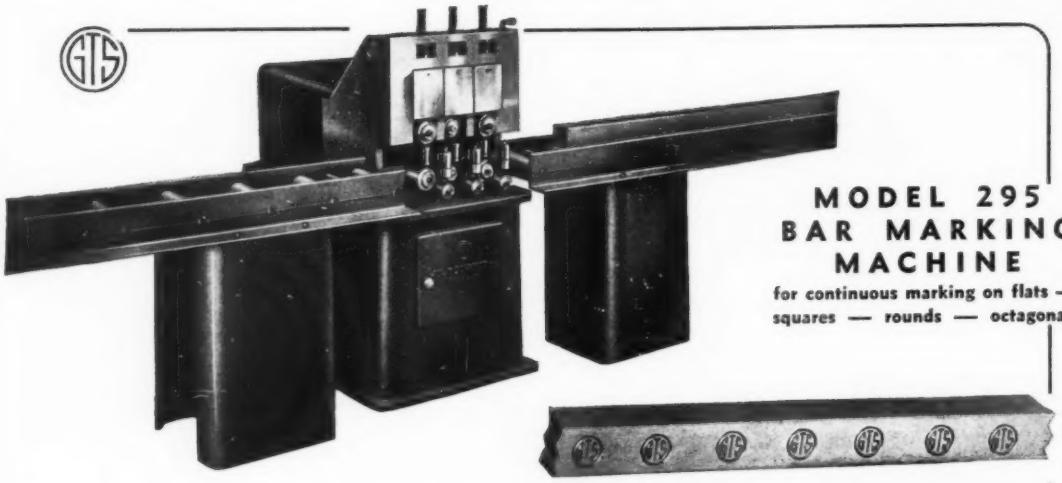
Catalog Free!

Write for new fact-and-picture-packed Air Power Catalog—or ask your nearest Mead Man!

MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., DEPT. MA-37
PATHFINDER IN AIR POWER AUTOMATION • CHICAGO 41, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1954

Precision . . . Speed . . . Versatility



MODEL 295
BAR MARKING
MACHINE

for continuous marking on flats — squares — rounds — octagonals

Simple horizontal and vertical adjustments on this unit fix the work for precision operation. Bars may be marked on one side only or on opposite faces. Intermittent marking is obtainable at desired intervals up to 9 in. Lettering knurls can be quickly changed by removing a single screw. Feed and discharge roller bearing tables are available with the unit. Write today for full information on Model 295, or any part of the famous GTS line of marking equipment.

GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

If it's Worth Making, It's Worth Marking.

CIRCLE INFORM-A-GRAM KEY NO. 1961

Drill Hardened Steels without Annealing—

USE
The New
IMPROVED
"HARDSTEEL"
DRILL

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

"HARDSTEEL"

CIRCLE INFORM-A-GRAM KEY NO. 1962

PRECISION CUTTERS!

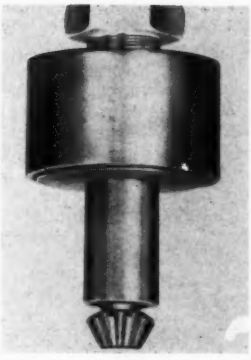
MADE TO YOUR EXACT SPECS . . . SOLID CARBIDE, OR CARBIDE TIPPED!

Why put up with stock cutters, when made-to-order cutters cost no more? Cutters designed for specific gang-milling, slotting, venting, slitting or grooving operations in various diameters and thickness to suit YOUR needs exactly. Fast service: all component materials carried in stock. Top-flight reputation for dependability built since 1888. Furnish complete specs, quantities desired and material to be cut when requesting prices. Write for Bulletin No. 51

W. F. MEYERS CO., INC., BEDFORD, INDIANA

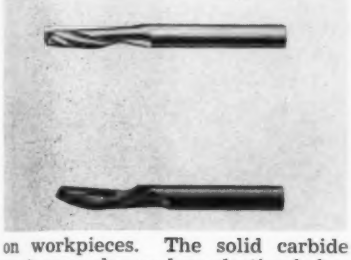
CIRCLE INFORM-A-GRAM KEY NO. 1963

Designed for Maximum Efficiency and simplicity of installation is an attachment for small hole turret drilling. The Jemco Drill-Tru drills deep holes accurately and concentrically from 0.004" to 0.1969" dia. Precision collets instead of bushings used to hold the drills reduce setup time to a minimum. Jersey Mfg. Co., 456 Livington St., Elizabeth, N. J., or —
Inform-A-Gram No. A64.



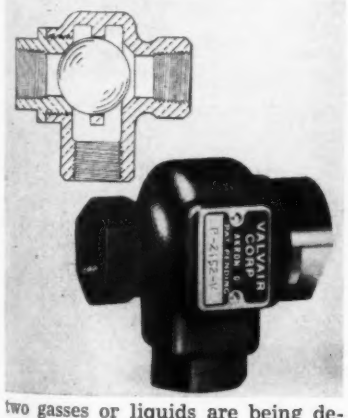
A Continuous Measuring Gage for centerless grinding machines has been announced by Federal Products Corp., 1144 Eddy St., Providence 1, R. I. Model 493-CG measures the output and visually indicates any trend toward out-of-tolerance work. Incorporating a time delay response, the gage responds to workpiece size only, ignoring local irregularities such as annular grooves.
Inform-A-Gram No. A67.

Solid Carbide Routers for use on abrasive materials are now available from The Atrax Co., Newington, Conn. They are designed to improve performance and increase production. Higher speeds and faster cutting action result in better finishes

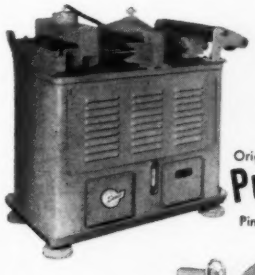


on workpieces. The solid carbide routers can be used on plastics, bakelite, die castings, copper, bronze, brass, aluminum, etc. They are available in a full range of standard sizes.
Circle Inform-A-Gram No. A65.

This Directional Valve provides instant switch-over from automatic to manual control of diaphragm-operated valves, cylinders and similar devices. It also can be used to prevent inter-mixing of supply when



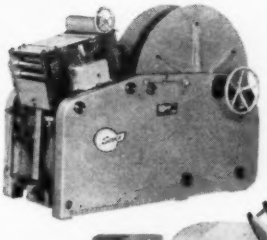
two gasses or liquids are being delivered alternately. The valve installed as a tee in the inlet lines, is used with air, oil, water or media compatible with Hycar and bronze. Valvair Corp., 454 Morgan Ave., Akron 11, O., or —
Circle Inform-A-Gram No. A66.



Sesco INC. 8881 Central Detroit 4, Mich.

Original
Punch Press Gripper Feed
Pinch Gripping Assures Scuff-Free Feeding

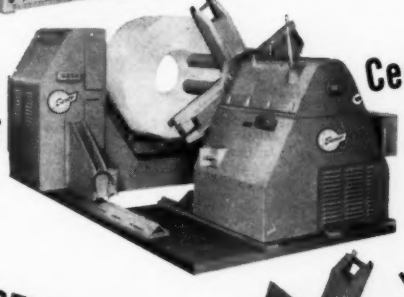
Cradle or Straightener available as separate units



Sesco coil handling equipment is completely powered at a controlled rate to customer specifications

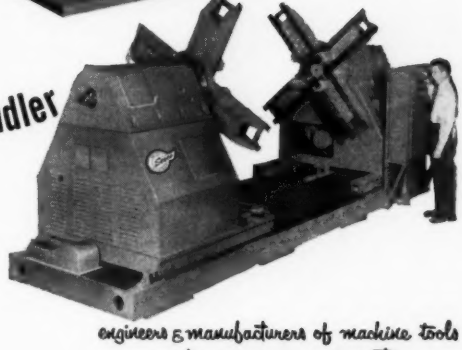
Combination Cradle and Straightener

Power-Lift Loader
It's a real production booster



Centering Reel
The first of its kind

TWIN-IN ACTION coil handler



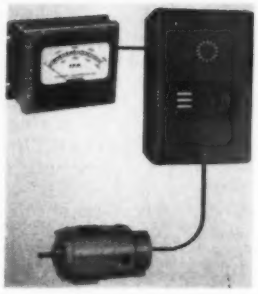
Sesco's broad experience enables its staff to render assisting services in the handling of coils and parts for the metal stamping industry

Write for Catalog or Visit our Plant

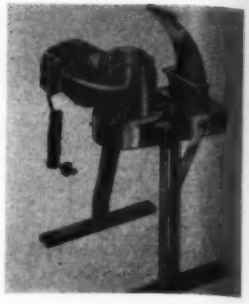
engineers & manufacturers of machine tools and press room equipment

CIRCLE INFORM-A-GRAM KEY NO. 197

This Speed Sensor Relay allows the use of speed as a controlling quantity. For example, processing or testing cycles can be automatically started after a pre-set speed has been reached. Model MEK-2060 can also be used as an under speed or over speed limit. It is available in either open or enclosed forms. Machinery Electrification, Inc., Northboro, Mass., or —
Inform-A-Gram No. A68.



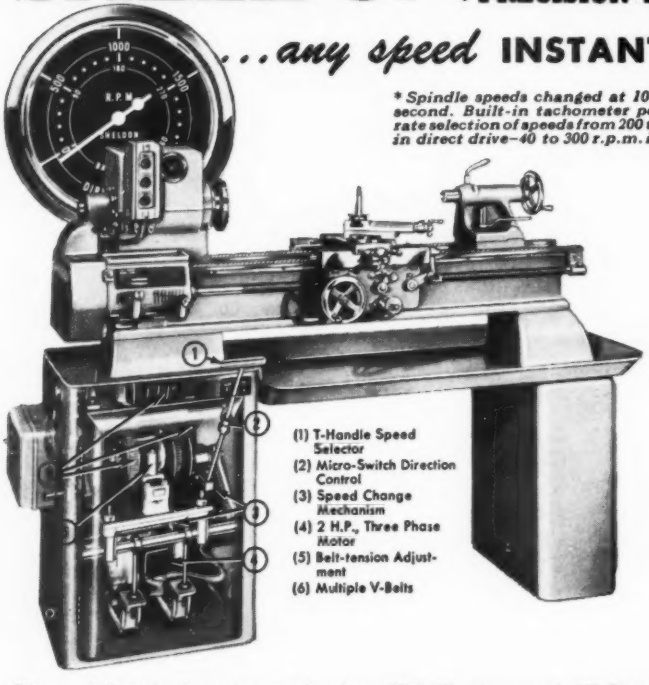
Eliminate Scrap Handling Problems with this scrap-chopper. The unit can be tipped at any angle to suit feeding material. Scrap stock is chopped by orbital shearing action, allowing equal opening at each end of the cutting blades to permit free entrance of material through the blades. Its capacity is 6″ wide by 0.065″ mild steel. Cooper Weymouth, Inc., Stratford, Conn., or — **Circle No. A69.**



SHELDON *Variable Speed* PRECISION LATHES

...any speed INSTANTLY*

** Spindle speeds changed at 100 r.p.m. per second. Built-in tachometer permits accurate selection of speeds from 200 to 1800 r.p.m. in direct drive—40 to 300 r.p.m. in back gear.*


(1) T-Handle Speed Selector
(2) Micro-Switch Direction Control
(3) Speed Change Mechanism
(4) 2 H.P., Three Phase Motor
(5) Belt-tension Adjustment
(6) Multiple V-Belts

This new lathe instantly meets every changing speed requirement in the tool room, or quickly sets and holds to any prescribed speed for production runs.

Rugged, Heavy-duty Variable Speed Drive—an oversized unit with double V-belts throughout that delivers positive full-power to the spindle.

High Spindle Speeds—from 200 r.p.m. to 1800 r.p.m. (direct drive), from 40 r.p.m. to 300 r.p.m. in back gear.

Instant and Automatic (power driven) Speed Selection—Only 9 seconds to change from low to high speeds in either direct drive or backgear. Speeds are changed automatically when T-handle is lifted or pushed into engagement.

High Horsepower at All Speeds—Because the drive unit is oversized, it has larger belts which deliver maximum gripping power at all speeds. A 2 H.P., three Phase motor recommended.

Additional lathe features: Zero Precision tapered roller spindle bearings, 54 pitch gear box, heavy cast pedestal, tool-room accuracy. Optional accessories include hardened bed ways, L00 long taper key drive or 4″ D1 Camlock spindles.

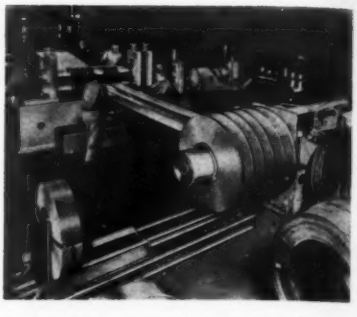
Sheldon Precision Variable Speed Drive Lathes are available in 11″ or 13″ Swing. Model WM-56-P (Illustrated) less motor and switch, $1,944.00 F.O.B. Chicago. Other 10″, 11″, and 13″ Sheldon Precision Lathes from $832.00 up. Also 13″ and 15″ Sebastian Geared Head Lathes, Sheldon Milling Machines and Sheldon Shapers.

Write for Catalog

SHELDON MACHINE CO. INC. 4235 N. Knox Ave. • Chicago 41, Ill.

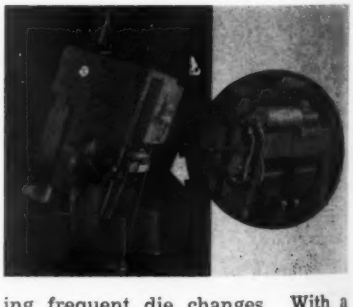
CIRCLE INFORM-A-GRAM KEY NO. 198

A Payoff Cone Type Uncoiler for slitting and cut-to-length lines has been developed by Universal Gear and Machine Co., 1301 E. McNichols Rd., Detroit. The uncoiler reel features adjustable tension control,



automatic or semi-automatic lateral adjustment, from 10″ to 32″ range for inside coil diameter. The cones can be on a 72″ line adjusted from a minimum of 6′ to a maximum of 80′.
Circle Inform-A-Gram No. A70.

A New Air Motor Inclining Device is now available on Series E, A and AA OBI presses manufactured by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. Easily operated with a hand valve, the device is suitable for presswork requir-



ing frequent die changes. With a shop air pressure of 80 or 85 psi, the press can be either inclined or brought upright over the full range in about 2 min. Get Supplement 56-57-58 from the company for details, or —
Circle Inform-A-Gram No. A71.

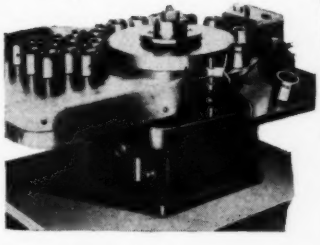
MARK IT *as you* MAKE IT!

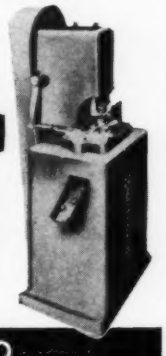
for Profit Saving

By incorporating a Matthews' Marking Station in your processing. Whether your product is round, contoured or flat; metal glass or plastic . . . one of Matthews' Marking applications is ideal for you.

Equipment to print, emboss, indent (by roller or stamping) or blast-etch marking is adaptable to most automatic operations.

Consulting service without obligation. Factory representatives in most major cities.





Illustrated are some of the many adaptations of Matthews' "Rotary". Automatic positioning, marking and ejection. Can fit into your production line and mark at your rates! Accommodates tubular, tapered or shaped rounds.

Write for complete information and literature.....

JAS. H. MATTHEWS & CO.

3920 Forbes St. Pittsburgh 13, Pa.

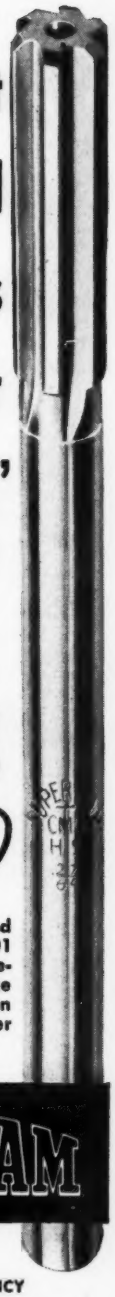
Philadelphia • Chicago • Clifton, N. J. • Boston • Jacksonville

CIRCLE INFORM-A-GRAM KEY NO. 1991

What other tool companies consider "SPECIALS"

(IN DECIMAL SIZES)

... WE STOCK AS STANDARD



Thousands of chucking and Stub Reamers by the .001 in Stock ready for the precise job. Why buy or make "SPECIALS" when you can BUY from STOCK — over night.

SUPEREAM

IN EMERGENCY
Telephone
Libertyville 2-4200

TWENTIETH CENTURY MANUFACTURING COMPANY

BOX 429-TP
LIBERTYVILLE, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1993

Compensates for Spindle Misalignment

KUTMORE ADJUSTABLE HOLLOW MILLS

The Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment.

WRITE TODAY For CATALOG 28-TD

It shows complete line of adjustable hollow mills. Our engineering department is at your disposal for special requirements.

1625 CLINTON AVE. NO.

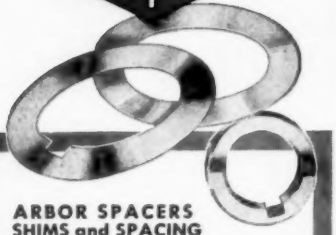
CARL WIRTH & SON, INC.

ROCHESTER 5, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1992

SPECIFY TOP QUALITY

DE-STA-CO



ARBOR SPACERS SHIMS and SPACING COLLARS • Arbor Spacers and Shims in 20 sizes and thicknesses from .001" to .125". Arbor Spacers furnished with standard keyway; Shims, with no keyway. Also Spacing Collars in numerous popular diameters, and in thicknesses from ⅛" to 3". Hardened and ground; edges chamfered. Furnished with standard keyway.

FEELER STOCK • Made from tempered stock, rolled to close tolerances, ½" x 25' coils packaged in transparent plastic boxes, except above .020". Strips ½" x 12", in cellophane. 27 thicknesses. All thicknesses from .001" to .032". (For use in precision fitting, checking clearances, inspection and production work.)

SHIM STOCK • Steel or brass. Selected from material rolled to precision limits, free from burrs, and protected by oil coating. Coils packed in carton for easy dispensing and protection. 15 thicknesses, .001" to .032". Sheets 6" x 12"; coils 6" x 120". Available also in two assortment packages—12 thicknesses, .001" to .015", and 15 thicknesses, .001" to .032".

DE-STA-CO

WRITE FOR Illustrated Brochure and Price List!

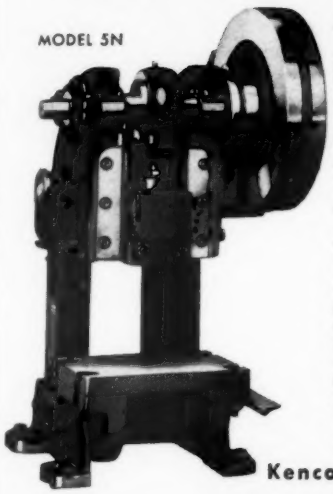
DETROIT STAMPING CO.

344 MIDLAND AVE. • DETROIT 3, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 2001

KENCO 5-TON PRECISION-BUILT PUNCH PRESSES

MODEL 5N



High speed punching... at low cost

These sturdy presses punch accurately and reliably at speeds up to 285 strokes per minute. Kenco-built for simple maintenance and long life, they save you time and manpower. Rugged, multiple-rib frame has tremendous strength... extra-long ram guides permit full use of the guiding area down to the bottom of the stroke for extra precision.

Six 5-ton models

provide low-cost solutions to many punching problems: Model 5 Standard (variable speed), Model 5-N Standard, Model 5-NR deep-throat (12¾" throat), Model 5-NA Universal 4-in-1 press, Model 5-A Universal Vari-speed, Model 5-R Vari-speed deep-throat.

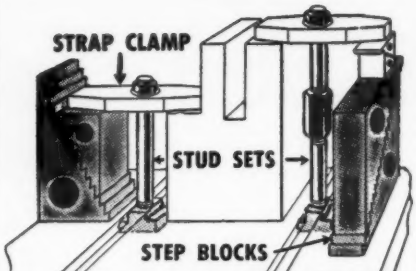
Kenco presses—14 models—2 to 15 tons

Write for literature

KENCO MANUFACTURING CO.

5211 Telegraph Road, Los Angeles 22, California

CIRCLE INFORM-A-GRAM KEY NO. 2002



SURE-GRIP STEP BLOCKS

Clamping tools of all types.

Write for free tracing templates

TIETZMANN TOOL CORP.

Box 277

North Main St., Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 2003

NEW YORK PLANT

REPUBLIC

TWIST DRILLS—REAMERS

Whether it is for No. 40 holes in Titanium sheets for Jets or 13/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.

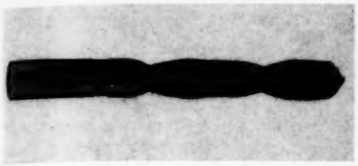
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.

MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

100 LAFAYETTE ST., NEW YORK 13, N. Y. 3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

CIRCLE INFORM-A-GRAM KEY NO. 2004

A Complete Line of High Speed Oil Hole Drills has been announced by Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. They are designed for use on production runs in screw machines or turret lathes. Continuous holes drilled through the

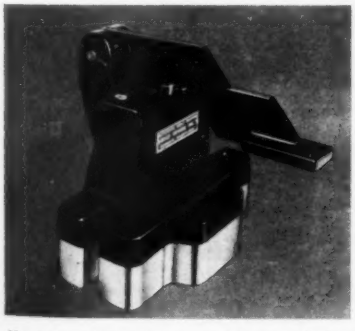


body and shank of the tool permit lubricant or air to pass freely to the drill point where it acts as a coolant, as well as a force to eject chips and dirt. The oil hole drills are stocked in straight shank taper length sizes from 7/16" to 1½" by 64ths.
Circle Inform-A-Gram No. A72.

Turn Both Large and Small Diameter Work with a new dual spindle lathe. The upper spindle provides an over-the-bed swing of 60" and the lower spindle, a 40" swing. The

various drives can be engaged and disengaged at will. Further information is found in Bulletin 2513 supplied by The Boye & Emmes Machine Tool Co., 81 Caldwell Dr., Cincinnati 16, O., or —
Circle Inform-A-Gram No. A73.

These Scrap Chopper Base Plates elevate Jaco choppers to the stock level of larger die sets in the punch press. They provide for a 2½" common stock line as required by larger



die sets. The low cost base plates are made in three sizes for the three sizes of Jaco scrap choppers. Jaco Devices Co., Inc., 100 High St., Hingham, Mass., or —
Circle Inform-A-Gram No. A74.

Form and Size Cylindrical, Conical and Polygonal Sheet Metal and Tubular Parts with this expander. Model 15-H-215 features extreme flexibility as to range of shapes and sizes of parts that can be handled by interchanging the draw bar, cone, jaws and table. It has a maximum draw bar pull of 215 tons at the maximum hydraulic system pressure of 3,000 psi. Grotnes Machine Works, Inc., 5454 Wolcott Ave., Chicago 40, or —
Circle Inform-A-Gram No. A75.

TREET-ALL
the
HEVI DUTY
Multi Purpose
FURNACE
for
TOOL ROOM AND
EXPERIMENTAL HEAT TREATING

With a maximum temperature of 1850° F., the TREET-ALL can easily handle your scale free hardening, carburizing, dry cyaniding and silver brazing.

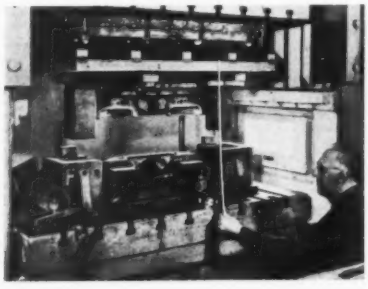
The alloy muffle and gasketed door form a tight seal which simplifies atmosphere control. The furnace, quench tank, cabinet and controls form a compact, completely wired unit.

Write for Bulletin HD-1147-BB

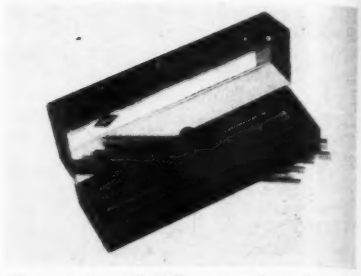
HEVI DUTY ELECTRIC COMPANY
HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS
MILWAUKEE 1, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 201

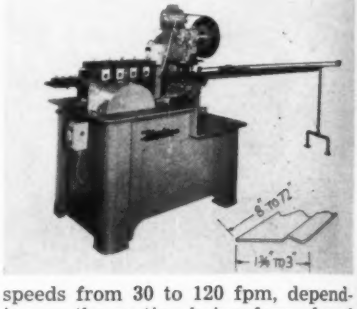
Glare-Free Illumination of the Entire Die Bed Area of punch presses is provided by a new line of machine lighting units. Presslites are reported to eliminate eye-strain, reduce operator fatigue and assure greater on-the-job safety. In addition, their use results in higher production with fewer rejects and less danger of damaging dies. Sun-Lite Mfg. Co., 2555 Bellevue Ave., Detroit 7, or —
Circle Inform-A-Gram No. A76.



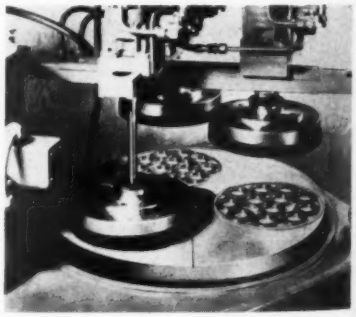
A Special Assortment of Small-Diameter Die Springs can now be obtained from The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn. Die Spring Assortment No. 40 contains 40 different wire sizes in eight spring diameters ranging from 3/32" to 1/2". Refill packages of 12 springs of a size are also available. Springs are of 10" lengths, with open ends, packaged for convenient storage and selection.
Circle Inform-A-Gram No. A77.



A Series of Lock Rolling or Roll Forming Machines has been produced equipped with a press type, flying cut-off attachment. They will form a variety of locks or shapes at speeds from 30 to 120 fpm, depending on the section being formed and the metal being used. Shown is Model U-254 tooled for rolling a furnace base slip joint at high speed. The Flagler Corp., 19331 Filer Ave., Detroit 34, or —
Circle Inform-A-Gram No. A78.



Production Polishing Equipment is now available for Model 24 Lapmaster Lapping Machine. The equipment converts the lapping machine into a high speed polishing unit that will handle the polishing requirements of parts of all types of materials at high production rates. Crane Packing Co., Dept. TPC, 6400 Oakton St., Morton Grove, Ill., or —
Circle Inform-A-Gram No. A79.



All Makes • Types and Sizes High Speed
Precision Boring and Grinding (including Hi-Cycle Units)

SPINDLES REPAIRED

IN HOURS . . . NOT WEEKS!

Also Anti-Friction Live Centers Restored to Original Accuracy

Air conditioned repair center, trained mechanics and immediate availability of all types of bearings required in these units. We guarantee satisfaction and prompt service!

BEARINGS, INC.

3634 EUCLID AVENUE • CLEVELAND 15, OHIO
Branches in OHIO • INDIANA • PENNSYLVANIA
WEST VIRGINIA • NEW JERSEY • KENTUCKY

Gentlemen:
I'd like to have complete information on your spindle repair service.

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 202

ETALON INGAGE

measures the exact BORE or blind hole size!

Reading: .0001"

Size: 3/16" to 1.6"

Takes accurate measurements of blind holes. No masters or setting rings—measures directly—by .0001".

Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 6 feet deep. Hardened contact points exert minimum pressure—will not damage fragile work.

Easy to read, deep graduations on a large diameter thimble. Dull chrome plated. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.

ALINA

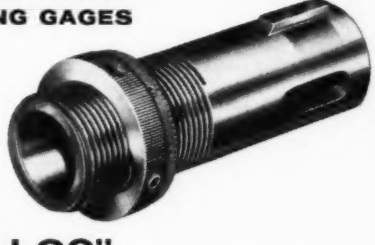
ALINA CORPORATION
122 East Second St.
Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2031

IT'S Economy ALL THE WAY!

— when you order your duplication requirements for these Standard Items . . .

A. G. D. PLUG & RING GAGES



"TRU-LOC"
Adjustable Adapter Sleeves and Nuts

A. S. A. DRILL BUSHINGS

"Economy" stocks always complete to assure immediate delivery. Worn-out plugs and ring gages salvaged at low cost.

Ask about the new "Economy" Extended O.D. Symbol Range. Dimensional Data Sheet No. 7-A Upon Request.

ECONOMY TOOL & MACHINE CO.

1828 SOUTH 68th STREET
MILWAUKEE 14, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 2032

How to find a perfect mate!

SPITFIRE

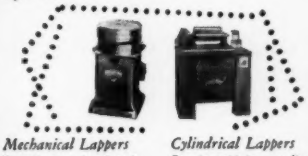
"Nth degree" LAPPING MACHINES

Valve components, mechanical seals, many other parts require perfect mates . . . possible by producing surfaces of precision flatness and finish. This quality control is "built-in" around the world . . . with Spitfire Machines.

whatever your lapping requirements . . . SPITFIRE offers the proved answer:

Automatic Gyro-Matic "21"

Three basic elements: the human, mechanical and economical . . . are combined in the Gyro-Matic "21". Simple operation means any production worker can produce precision lapped parts. Micro-inch lapping to .0000116" flatness is standard. Rapid push-button control minimizes man-hours. Where critical parts are standard . . . so is the Spitfire Gyro-Matic "21".



Mechanical Lappers
Permits any size firm to incorporate super fine finishing on most production lines. The most economical method of attaining high level parts quality control.

Cylindrical Lappers
For closest tolerance finishes to 1 RMS or less on plug gages, shoulders, all types of cylindrical parts. Available in floor and bench type models.

Get full details . . . mail this coupon today!

SPITFIRE TOOL CO., Dept. TP-3
2931 N. Pulaski Rd., Chicago 41, Ill.

Name_____
Firm_____
Address_____
City_____ Zone____ State____

CIRCLE INFORM-A-GRAM KEY NO. 2033

BUILD YOUR OWN
AUTOMATIC DRILLING OR TAPPING MACHINE

With Govro-Nelson Automatic Drilling and Tapping Units, together with the bases and electrical controls which we can supply, you can build yourself an automatic drilling or tapping machine at substantially lower cost than a special machine.

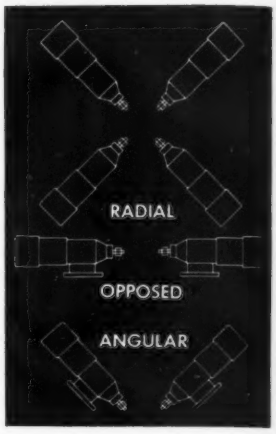
Any number of units may be employed. Examples of the various ways in which they may be arranged are shown at the right.

DRILLING UNITS

The Drilling Units are made in several sizes with spindle speeds from 1100 to 3450 RPM. Drill Units have full Hydraulic Control with external adjustment for the rapid approach, the rate of feed and the length of stroke. Suitable for drills up to ⅜", depending on material.

TAPPING UNITS

The Tapping Units are available in two sizes with 550 and 1725 RPM spindle speed. Features include no clutch and no lead screw and automatic adjustment for various leads. Suitable for tapping 0-80 to ⅜-16, depending on material.



Write for Literature

Automatic **DRILLING UNIT**

GOVRO-NELSON CO.

Machinists of Precision Parts for 34 Years

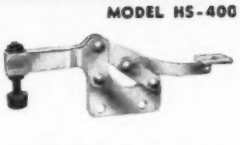
1933 ANTOINETTE DETROIT 8, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 2041

Production UP at NORTHROP

KNU-VISE clamps help cut drilling time

MODEL HS-400



Wherever fast, positive material holding is required—Knu-Vise toggle-action clamps are helping manufacturers do a better job.

One application is shown above. This time Knu-Vise clamps are in use on a special fixture developed by Northrop Aircraft engineers for simultaneous drilling of seven rocket pod orifice holes for the Northrop F-89 Scorpion. Drilling time has been reduced from 10 hours to 45 minutes—including set-up time.

REMEMBER—if you have a holding problem—Lapeer Mfg. Co. offers a wide range of hand, air and oil operated clamps to increase efficiency and lower costs. Our catalog contains complete information. Write for your copy today.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**

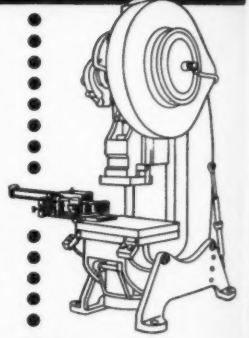
3064 DAVISON ROAD • **LAPEER, MICHIGAN**

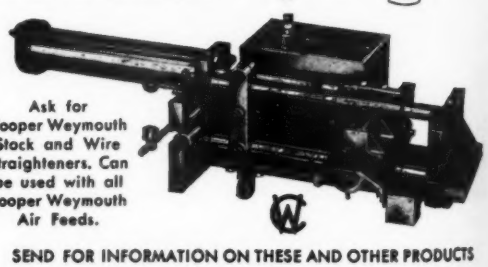
WESTERN DIVISION, 422 Magnolia, Glendale, California • CANADIAN DIVISION Higginson Engr., Hamilton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 2042

COOPER WEYMOUTH
AIR OPERATED SLIDE FEEDS
Boost Power Press Production

Specifically designed to solve the automatic feeding problems in press rooms. Simplified, open throat construction. Air operated from standard shop lines. Easily set up and adjusted at the front, rear or sides of press for accurate long or short runs. Cooper Weymouth Air Feeds, made in five sizes, will feed lengths up to 36", of stock up to 18" in width. They are readily adaptable to material of irregular cross section and ideal for use with hydraulic presses.





Ask for Cooper Weymouth Stock and Wire Straighteners. Can be used with all Cooper Weymouth Air Feeds.

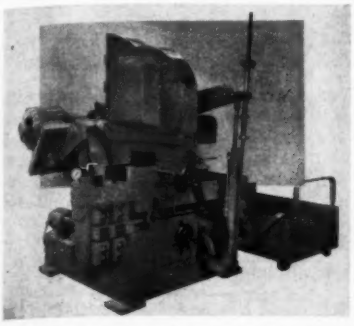
SEND FOR INFORMATION ON THESE AND OTHER PRODUCTS

COOPER WEYMOUTH, INC.

600 HONEYSPOT ROAD, STRATFORD, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 2043

Cut Large Diameter Bar Stock, tubing and other shapes, ferrous and non-ferrous metals, with a wet abrasive cutting machine. Model 481 Wet Abrasive Oscillating Cutting Machine will cut almost any metal within its capacity of 8" square solids

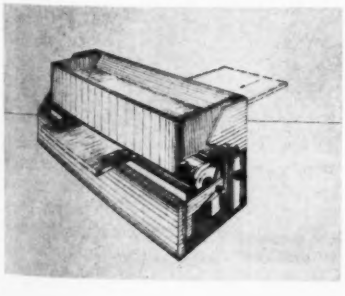


with a minimum of burr. The wheel feed and work clamps are hydraulically operated and the work bar is hand fed. American Chain & Cable Co., Inc., Campbell Machine Div'n, Bridgeport 2, Conn., or —
Circle Inform-A-Gram No. A80.

Speed Production with a new boring bar with built-in coolant tube. Coolant travels the length of the "W" Boring Bar and is sprayed directly on top of the cutting edge through an adjustable nozzle. Hea-

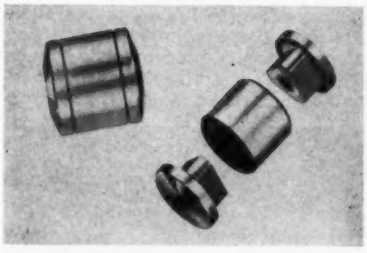
vier cuts can be taken at higher speeds. The W Bar is used with detachable cutter heads in three sizes for boring, facing and internal threading. R. B. Tool Co., Inc., 785 N. Broadway, White Plains, N. Y., or
Circle Inform-A-Gram No. A81.

Increase Die Life and improve the quality of many punch press products by using a strip feed lubricator. The device works both on continuous

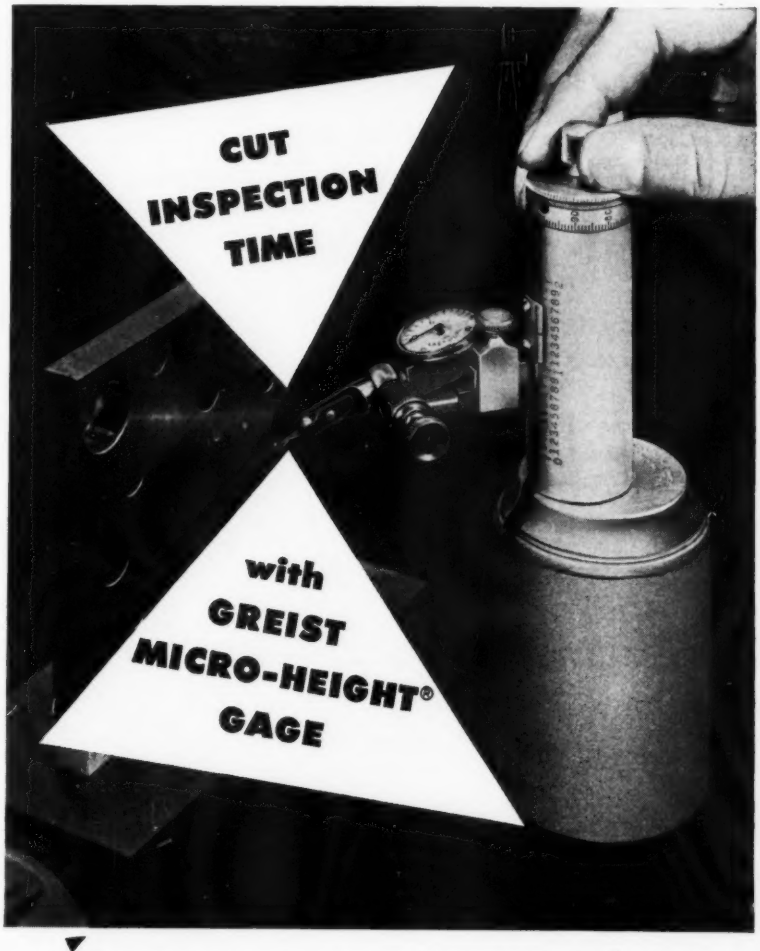


coil stock and random length pieces. It wipes the surface of the stock clean and then places a thin even film of lubricant on either or both sides of the strip stock. The strip feed lubricator can be mounted in place on any punch press in a few minutes. Automation for Industry, Port Crane, N. Y., or —
Circle Inform-A-Gram No. A82.

Designed for Fractional Horsepower Duty are three new flexible couplings introduced by Smith & Serrell Inc., 200 Washington St., Newark 2, N. J. Flex-Ring Couplings are offered in bore sizes ranging from 3/16" to



1¼", ⅞" to 2½" dia, and lengths from ⅞" to 2¼". They are easily installed and lined up, and require no lubrication.
Circle Inform-A-Gram No. A83.



Precision-built Micro-Height reads **faster than your micrometer!** It measures height direct from **zero at base** to 3". Hundredths on barrel ...thousandths on large head that **cuts reading time!** Attach your dial indicator for quick measuring between holes, surfaces!

CUT LAYOUT TIME! Micro-Height also scribes like your vernier height gage. Riser extends range to 9". Precision-built, satin-chrome finished Micro-Height Gage quickly pays for itself!

Call your distributor or write

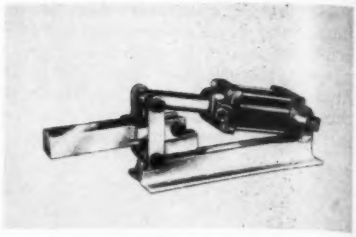
THE **GREIST** MANUFACTURING COMPANY, 483 BLAKE STREET, NEW HAVEN 15, CONN.

Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 205

Exceptionally Long Strokes are a feature of a complete line of horizontal surface broaching machines. There are several 240" stroke ElectroGear-drive machines in a number of styles. Similar models are also offered with 180" strokes. Broaching speeds range up to 300 fpm. Colonial Broach and Machine Co., 21601 Hoover Rd., Detroit, or —
Circle Inform-A-Gram No. A84.

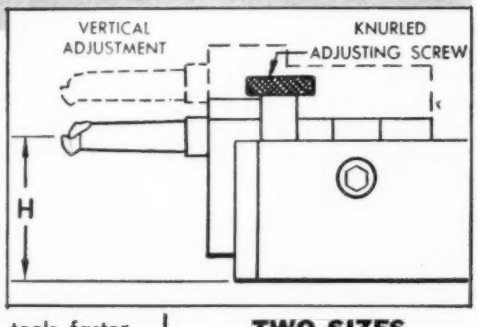
Designed for Tough Holding Jobs are the new heavy-duty clamps added to the line produced by Lapeer Mfg. Co., 3042 Davison Rd., Lapeer, Mich. The new heavy-duty hand clamp is available in four models with either a solid bar or channel bar type of cold rolled steel with clamping pressures of either 200 or 400 lbs. Two new air or oil operated clamps have the solid-bar features for demanding applications of automation. Shown is Model AOS-400 (HD).
Circle Inform-A-Gram No. A85.



Accurate—yet simple to set up!

TOOL HOLDERS

for Bokum Boring and Threading Tools



Lathe operators can set up tools faster and more accurately with Bokum tool holders. Adjustment is simple; the only movement—straight up and down—is controlled by a knurled Acme screw. Tool is positively locked in place.

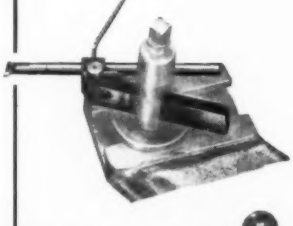
TWO SIZES

BT-0 SHANK, size ⅜" x 1" "H" adjustable from ⅜" to 1"

BT-1 SHANK, size ½" x 1¼" "H" adjustable from 1⅜" to 1⅝"

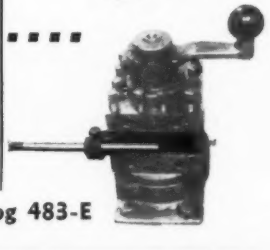
For Engine Lathes..

Tool or bit is held under an angle of 30° with the axis of the shank in order to bypass the tool post of the lathe.



For Turret Lathes.....

Tool is held parallel to the axis of the shank. Holders, for both engine and turret lathes, available for ⅜" and ½" square tool bits.



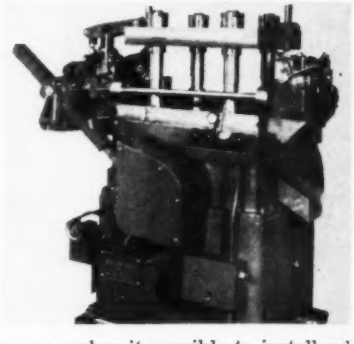
Write for catalog 483-E

TRADE MARK REG. U. S. PAT. OFF.

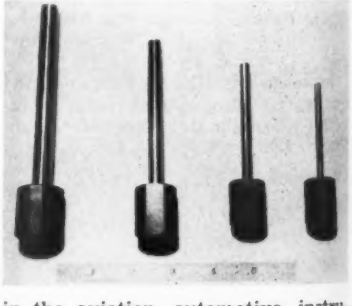
BOKUM TOOL CO. INC. 14775 Wildemere Ave. Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 206

Speeds Up To 500 Strokes/Min are provided by the new 30-ton Automatic Press. It is ideal for use in blanking large quantities of small parts. The compact design of the press makes it possible to install and remove dies easily and quickly with a minimum of down time. The Brandes Press Co., 6408 Euclid Ave., Cleveland 3, or —
Circle Inform-A-Gram No. A86.

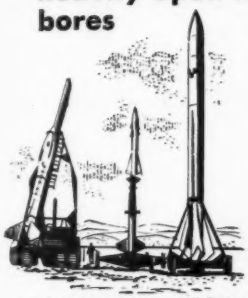


A Line of Flush Pin Gages, finished for production and inspection, is now being produced by Foster & Allen, Inc., Garwood, N. J. The Royal Flush Pin Gages can be used in the aviation, automotive, instrument and ordnance industries, in general machine shop work and in automatic screw machine work. They are available in four standard models and many special combinations.
Circle Inform-A-Gram No. A87.

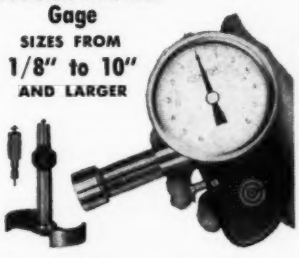


Did you know that – – –

Jet Propulsion Equipment relies heavily upon this gage for critical bores



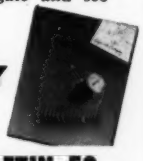
Precision Internal Gage
SIZES FROM
1/8" to 10"
AND LARGER



COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 10" dia.

UNIQUE ADVANTAGES
- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed — not passing — reading.
- Positive 2-point gaging — automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Will gage work in the machine.
- A shop tool for all-day every day use.
- Portable — no wires, hoses, stands or electronic gear.

Investigate the gage used by the thousands in jet engine, guided missile, farm and road machinery, automotive transmission, household appliance and other volume-precision plants. IT MAKES PRECISION EASY . . . at machines . . . at inspection bench . . . for selective assembly. No other like it — investigate and see why.



COMTOR COMPANY
82 Farwell St.
WALTHAM 54
MASS.

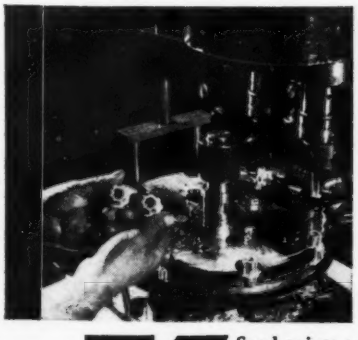
GET THE FACTS — REQUEST BULLETIN 50

CIRCLE INFORM-A-GRAM KEY NO. 2071

TAPPING . . . 2,040 Aluminum Pistons PER HOUR

½" . . thread—¾" stroke at 500 RPM

That's *actual production tapping*, as accomplished with a Kaufman Model 5-24 lead screw tapping machine, tooled with a 4 division index, dial and dial spindle multiple head. "Setting Up" for other tapping operations is accomplished by replacing dial plate and taps.



TOOLING FOR TOMORROW

As you plan production machines for the future . . . study the highly-precisioned machines available from Kaufman. Machines specifically designed for high-production runs, or for the versatile, multiple, Machine Shop requirements.

Send prints and samples of your work to . . .

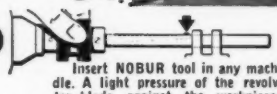
KAUFMAN MFG. CO.
529 S. 29th ST., MANITOWOC, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 2072

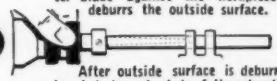
HOW TO . . . . DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

★FASTER
★EASIER

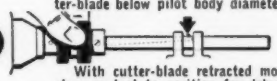
No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.



1 Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.



2 After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.



3 With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

Write for FREE Folder
Send for all details on Nobur Tool Products TODAY!

N-11

NO BUR TOOLS **NOBUR MANUFACTURING CO.**
6860 Farmdale Ave., No. Hollywood, California

WESTERN METAL CONGRESS — BOOTH 676

CIRCLE INFORM-A-GRAM KEY NO. 2073

HASSNER QUICK CHANGE PRECISION CHUCKS

WHAT DO THEY OFFER YOU?

a. Superiority in PRECISION.
b. Tool Change can be made with spindle rotating up to 7,000 RPM.
c. Shifting and slipping impossible; no chewed up tools.

ALL THIS MEANS BETTER WORK AND TIME SAVING, THUS INCREASED PROFITS

NEISE MODERN TOOLS **KARL A. NEISE** 404 4th Ave., Dept. TP New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2074

Expanding Mandrels

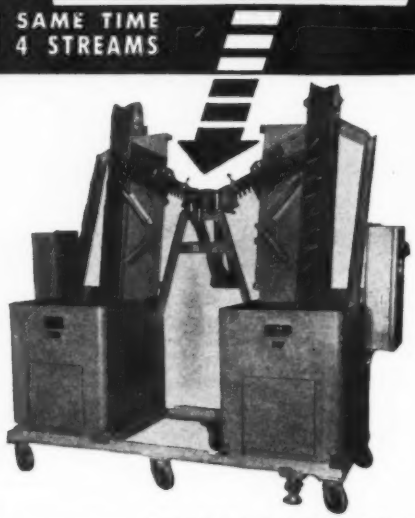
Accuracy 001" - No Distortion
No Slipping - Everlasting

K.O. LEE CO.
ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 2075

DUPLEX **FEEDALL** UNIT
FEEDS 2 Different Parts
. . . AT SAME TIME
. . . IN 4 STREAMS



This ingenious arrangement of 2 Model 2200 Feedall Units was necessary to feed two different sizes of headed parts in two streams each to an Avey Automatic Drilling Machine. Notice that the unit is made fully portable by being built on a steel base with heavy casters.

Tell us your automatic feeding problems and let our engineers help you.

FEEDALL INCORPORATED WILLOUGHBY, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2081

Aget offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

AGET MANUFACTURING COMPANY
1394 E. CHURCH STREET • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 2082

"When You Can't Turn the Tap Wrench for Lack of Space . . ."

WALTON TAP EXTENSIONS
QUICKLY PROVIDE NEEDED LENGTH

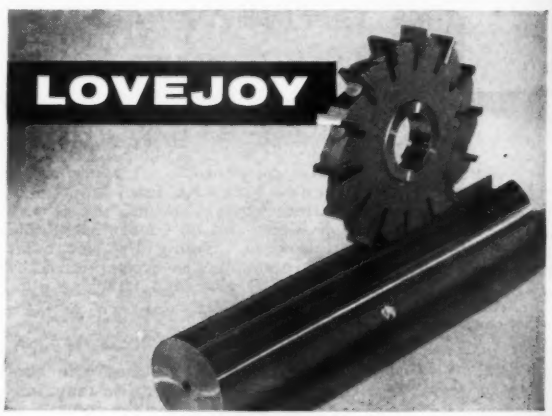
Walton Tap Extensions are a quick solution to this troublesome problem. They are sold in sets of two 5" extensions for use singly or in combination.

Fit all standard hand taps (4-flute, 3-flute, and 2-flute styles) from #10 (3/16") to 1" inclusive. They are made of special alloy steel, heat-treated, with square openings cold drawn to conform to size.

Write us, or simply attach this advertisement to your letterhead, to receive descriptive Data Folder #38, giving sizes, prices, and complete specifications of all **WALTON Specialized TOOLS.**

The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 2083



Type "S" Slotting & Milling Cutters
with Pre-formed Solid Carbide Blades

The Lovejoy Type "S" has *more, stronger, more rigid* teeth per tool than any other inserted-tooth milling cutter. One body mills numerous metals. The most economical carbide cutter made — saves on blade replacement and on width and diameter adjustments. *Outstanding performance with Minimum Maintenance!* Write for Catalog No. 34.

NEW "SF" end mill with inserted solid carbide blades. One cutter body mills numerous metals.

Write for Bulletin No. 101

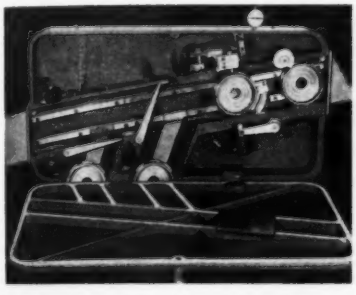
LOVEJOY TOOL COMPANY, INC.
146 Main Street, Springfield, Vermont, U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 2084

Quicker, More Accurate Measurement of Shallow Slots, Grooves and Holes is performed by a new adjustable indicator gage. The Shalo-Chek Gage can be used at the machine to check depths ranging from 1/32" to

½". Three standard models are available for checking dimensions ranging from ½" to 6", 4" to 12" and 10" to 18". Ellstrom, Inc., Dearborn, Mich., or —
Circle Inform-A-Gram No. A88.

Check The Root Diameters of External Splines or Keyways on drum type parts with an automatic, probe-type, monitoring system. The 3-Way Gear Classifier will automatically gage oversize, undersize, and correct-size splines or keyways produced on

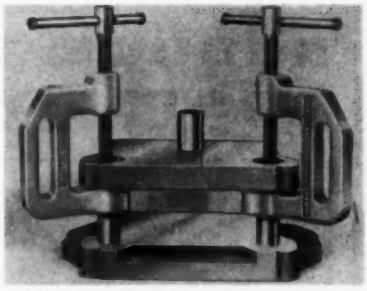


hobbers, shapers, shavers, or Shear-Speed machines. Both a visual and electrical check of production accuracy is provided. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or **Circle Inform-A-Gram No. A89.**

Detect and Measure Wear in Bearings, Gears, Spindles or Slides without disassembly of machinery with the Bearing Tester. This electrified screwdriver probe pinpoints wear in machine parts. A meter gives visual

readings and the loud speaker audible ones. The instrument's parts-motion range extends from a few ipm, on sliding ways and carriages, up to 150,000 rpm for rotating parts. Sperry Products, Inc., Danbury, Conn., or —
Circle Inform-A-Gram No. A90.

Three Sizes of Shur-Pull Die Set Pullers are now available from Durant Tool Supply Co., 1-15 Thurbers Ave., Providence 5, R. I. They are designed to easily remove the punch holder from the die shoe by a straight upward pull. Inexpensive



Shur-Pull Die Set Pullers will not damage the die set. **Circle No. A91.**

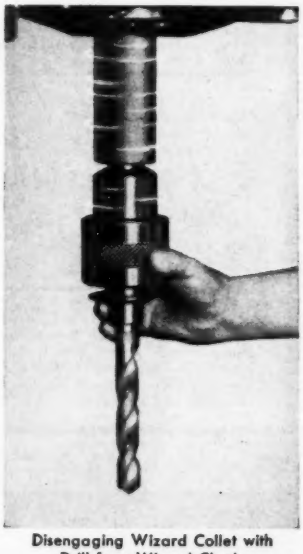
Speed Production and CUT COSTS!

Multiple tool jobs become continuous with

McCROSKY *Wizard*® QUICK-CHANGE CHUCKS and COLLETS

holds tools rigidly and centered

There's no stopping — or even slowing down the spindle for tool changes when you use Wizard Quick-Change Chucks and Collets. To release the tool the operator simply grips the chuck lightly with his thumb and forefinger, and the collet drops out into his hand. The next tool and collet is then pushed up into the revolving spindle;— is centered automatically;— and locked rigidly in position;— speeding up production and cutting costs. Try Wizard Chucks and Collets once and you'll never be without them. Furnished in four sizes. Write for a fully descriptive catalog today!



Disengaging Wizard Collet with Drill from Wizard Chuck.

Wizard Equipment being used with Radial Drill.

Wizard Equipment on Multiple Operation Job.

The complete McCrosky line includes:

Jack-Lock® Milling Cutters — *Wizard*® Quick-Change Chucks
Super® Adjustable Reamers — *Block Type* Boring Bars
Turret Tool Posts — *Specially Engineered* Multiple Operation Tools

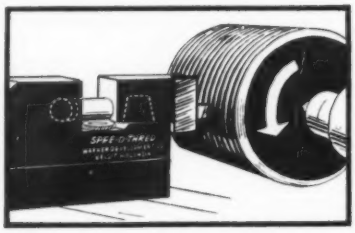
Fully descriptive catalogs sent promptly on request. Write for yours today!

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION** MEADVILLE, PA.

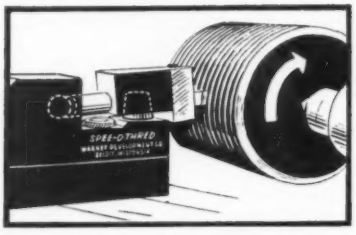
Engineering and Sales Representatives in the Principal Cities

CIRCLE INFORM-A-GRAM KEY NO. 209

REDUCE THREADING COSTS BY HALF! (or more!)



CUTTING. Normal tool operation, with cutter accurately positioned by ball and cone, and held in position firmly by downward forces.



REVERSING. Tool releases on cone when forces are reversed, riding up and tipping freely to follow thread without marring or scratching (even on aluminum). Ball and cone are specially fitted to release freely yet reposition cutter as accurately as a solid holder.

SPEE-D-THRED
REVERSE-RIDING TOOL HOLDER

Single-point threading on an engine lathe can now be done in *half* (and less) of the usual time with the new SPEE-D-THRED tool. You simply *reverse the lathe* at the end of each cut. The tool rides free on the thread without scratching or marring on the return trip, then repositions accurately and solidly when the next cut starts.

NO WASTE TIME

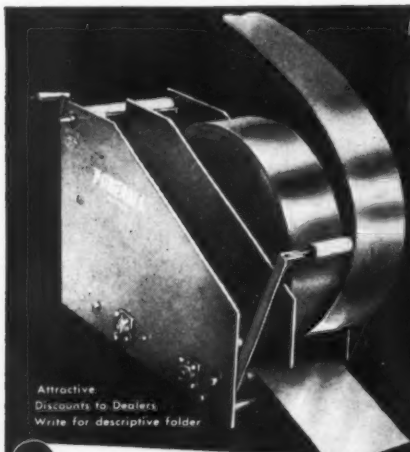
During the return stroke you can set in the feed for the next cut without stopping the lathe. No need to back off the cross slide. No need to disengage the feed nut, lead screw stays in registration. No need to match an index mark. *You save all this time* and you cut scrap to the vanishing point!

WRITE FOR LITERATURE

On your request we will send promptly detailed literature describing further valuable features of the operation of this remarkable tool. Ask for Bulletin ST 656.

WARNER DEVELOPMENT CO.
BOX 33, SOUTH BELOIT, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 2101



MORE EFFICIENCY — LESS WORK

THE MEDELTON POWEROLL
AUTOMATIC COIL CRADLE

Every Stamping Room Needs One

One man loads it in a minute . . . no hoists . . . coils roll on . . . no lifting . . . no danger of slippage

No operator fatigue on hand-feed jobs . . . slack loop always maintained . . . steady, sure feed...spoilage minimized

Less space needed . . . cradle butts against press . . . can be moved to other presses when needed . . . slack stored above cradle

Model R-104 for 10" widths, 1000 lb. coils $325
Model R-204 for 13" widths, 2000 lb. coils $405
Model R-304 Handles stock to 24" wide, 48" diameter, weight to 3000 lbs. Price on application.

Attractive Discounts to Dealers. Write for descriptive folder

The **medelton** Company, Inc.

335 E. 142 ST., Bronx 54, N. Y.

Toolmakers • Designers • Dies • Stampings

CIRCLE INFORM-A-GRAM KEY NO. 2102

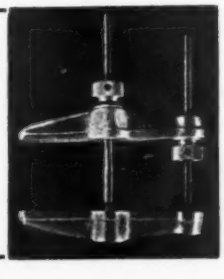
Monarch VISE ACTION CLAMP

For Toolmakers — Inspectors — General Machine Work
Woodworkers — Fabricators

Grips The Work Straight • Like A Vise • Without Side Slipping • Fast - Positive - Lightweight • Tough Aluminum Alloy Jaws • Capacity to 4½ Inches

One of the most efficient clamps ever devised for Strength, Holding Power, Capacity, Quick and Easy Operation. Try them, you'll want more—low price. Dealers Desired

C. B. TEETER, TOOL ROOM SPECIALTIES
4470 Oakenwald Ave., Chicago 15, Ill.



CIRCLE INFORM-A-GRAM KEY NO. 2103

PRODUCTION HONING COMPRESSOR BORES TO 10 MICRO-INCHES

Cylinder bores, cross bores, and piston-pin bores of the refrigerator compressors built by Tecumseh Products Company, are surface finished by specially designed horizontal Microhoning machines.

Volume production honing of these compressor bores require the total capacity of 18 special Microhoning machines, built by Micromatic Hone Corporation.

The two piston bores in each crankcase are located opposite each other when viewed vertically, but lie in two different horizontal planes. Although the crankcases are similar in design, these bores come in four diameter sizes (1.312", 1.375", 1.500", 1.625") and are approximately 2" long.

To permit the two piston bores to be honed simultaneously, horizontal machines with two opposing spindles are used. By utilizing two special fixtures on a rotary indexing table, one crankcase is honed while another is being loaded.

When a run of crankcases of different piston bore diameters is scheduled, only the tools and (Microsize) gage rings are changed — a switch-over which takes about five minutes. The honing cycle is approximately 18 sec, including the fixture indexing time.

The piston is selective-fitted to the honed bore to a tolerance of 0.0001". This accuracy results in a running seal which is so effective in preventing gas leakage that no rings are required on the piston.

The crankcase material is cast iron on which boring operations have been performed previously to honing. Stock removed by honing is 0.0007" to 0.001", while a finish of 10 micro-inches is achieved. Tolerances held are diametric — 0.0003", roundness — 0.00015", and straightness (taper) — 0.00015".

Abrasives are being shipped in cardboard tubes, similar to conventional mailing containers, by Electro Refractories & Abrasives Corp. The company is using the tubes to accommodate wheels up to 3" dia. The containers provide for simple removal of one wheel at a time and afford protection against damage on customers' shelves.

NO ONE IS AMAZED AT JUNIOR ANY MORE . . .

LOOK.... NO HANDS

. . . when VFC fed the production line one-half million parts per hour WITHOUT HANDS .....INDUSTRY MARVELED!

Successful automatic production depends on the uninterrupted delivery of components properly positioned and perfectly timed. Engineering and feeder know-how will help you accomplish this better in the least possible time. VFC is an authority in small parts feeding . . . Better production through better parts feeding is their business. If you want to produce more, write, wire, or call VFC.

VFC . . . . *VERY FINE CRAFTSMANSHIP*

VIBRATORY FEEDER COMPANY

32nd and BRANDES STS., ERIE, PA. • • PHONE 4-6320

Division of Automation Devices, Inc.

REMEMBER:
Vibratory Feeder Company is a manufacturer of basic feeder and bowl equipment for the industry . . . . . .

CIRCLE INFORM-A-GRAM KEY NO. 2111

NEW!

Wells Roto-Veyor AUTOMATIC BAR FEED

The Wells Roto-Veyor is an entirely new concept in automatic bar feeds. Designed specifically for use with the Wells Model 1200 Band Saw, the Roto-Veyor converts it into a heavy duty completely automatic cut-off machine.

All conveyor feed rollers are mechanically powered —electrically controlled. The Roto-Veyor is capable of unlimited projection length. Feed mechanism and stock clamping action is synchronized with the saw to provide accurate repetitive cutting.

The Roto-Veyor will improve the saw's efficiency, save time, and reduce production cutting costs. *Write today for complete information.*

See us in Booth No. 559 Western Metal Exposition, Los Angeles, March 25-29.

Wells Saws

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

1940 Cedar Street • Three Rivers, Michigan

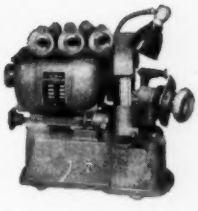
CIRCLE INFORM-A-GRAM KEY NO. 2112

SAVE DRILLS!

NOW PRECISION DRILL GRINDING BY ANY INEXPERIENCED WORKER

FOR DRILLS UP TO ¾" . . .

The BLACK DIAMOND Drill Grinder restores an old drill to like-new precision sharpness . . . in 10 seconds! Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



FOR DRILLS UP TO 2½" . . .

The WORCESTER Drill Grinder (now manufactured by Black Diamond) sharpens 2, 3, or 4-lip drills, flat, flat twisted or chucking, up to 2½". Clearances are easily and instantly changeable, feeding is controlled by micrometer adjustment

FREE BULLETIN

Get all the facts! 4 page illustrated bulletin gives complete story *Write Today!*

BLACK DIAMOND

SAW & MACHINE WORKS 75 NORTH AVE., NATICK, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 2113

TECHNICAL BOOKS

HUEBNER PUBLICATIONS, INC.
1975 LEE ROAD, CLEVELAND 18, OHIO

Gentlemen: Please send me the publications I have checked.

☐ **DIE DESIGNING AND ESTIMATING**
Fourth edition. 368 pages, 26 chapters, and over 400 illustrations, drawings, charts and graphs. Extensively revised and enlarged plus a special section of 165 Practical Points in Die Design and Construction. Completely indexed.
_____copies @ $7.50 per copy. Total $_____

☐ **MICROSTRUCTURES OF DIAMOND SURFACES**
By S. Tolansky. 11 chapters of original research in the field of diamond growth. New optical techniques explained and illustrated which enable height or depth features as small as one twenty-five millionth of an inch to be resolved and magnifications in depth of half a million times to be made. 143 special art plates.
_____copies @ $8.50 per copy. Total $_____

☐ **DIAMOND TOOLS**
By Paul Grodzinski. A 379-page handbook on the industrial use of diamonds. Case histories and illustrations describe those applications in which the diamond has proved the most satisfactory tool in performance, precision and economy.
_____copies @ $4.50 per copy. Total $_____

☐ **DIAMOND TECHNOLOGY**
By Paul Grodzinski. The only standard work on the subject and the only book of its kind in technical literature. 784 pages, 93 working tables, and over 486 photographs and drawings.
_____ copies @ $10.00 per copy. Total $_____

☐ **GEARS for Small Mechanisms**
By W. O. Davis. 20 chapters, profusely illustrated covering everything from The Theory and Practice of the Design of Very Small Gears to The Design of Tools for Cutting and Generating Gear Tooth Forms.
_____copies @ $5.00 per copy. Total $_____

☐ **TREATISE ON MILLING AND MILLING MACHINES**
By The Cincinnati Milling Machine Co. Gives you the answer to practically every metalworking problem in the field of milling from the toolroom to fixture design and high production milling. 896 pages, over 200 formulas and 700 illustrations and charts.
_____copies @ $8.00 per copy. Total $_____

☐ **COLD FORMING OF THE STAINLESS STEELS**
By Lester F. Spencer. 28 pages of KNOW-HOW on the blanking, punching, perforating, and bending, forming, deep drawing and spinning of the stainless steels.
_____copies @ $1.00 per copy. Total $_____

☐ **MACHINING, HEAT TREATMENT & PICKLING OF THE STAINLESS STEELS**
By Lester F. Spencer. 36 pages on the working of stainless — including drilling, tapping, threading, reaming, skiving, milling, broaching and shaving, plus heating and quenching procedures.
_____copies @ $1.50 per copy. Total $_____

TOTAL AMT. OF ORDER $ | |

Check, money order or cash with order, please. Open account shipments on company purchase orders when total amount exceeds $3.00. No. C.O.D.'s please. Ohio customers add 3% sales tax. Quantity Prices quoted on request.

COMPANY_____

BY_____TITLE_____

ADDRESS_____

CITY_____ZONE_____STATE_____

TWO NEW SEGMENTED TRANSFER MACHINES PUT INTO PRODUCTION

Two new segmented transfer machines have been developed for the automotive industry by the Snyder Tool and Engineering Co.

One of them is a 26-station machine that processes forged steel steering knuckles. This 60' long machine mills, hollow mills, drills, spotfaces, taps and reams steering knuckles at a net production rate of 146 pcs/hr.

Two parts at a time are clamped in pallet-type fixtures that are moved from station-to-station in the machining section with a transfer mechanism. The pallets are returned to the first machining operation by a motorized conveyor through a wash and blow-off operation. A unique automatic clamping fixture speeds part clamping and unclamping operations as well as assuring that the forgings are clamped in a position that will provide uniform stock removal from all machined faces. The parts are located in the fixtures by initially holding them down against V-locators with hydraulic cylinders. Then spring-operated jacks are hydraulically released and air wrenches automatically clamp the part.

All machine operations are performed with units that have individual bases and individual control panels to simplify maintenance problems and provide maximum flexibility for part design changes.

The other is an in-line segmented special transfer machine for boring and tapping automotive differential carrier and cap assemblies. The machine performs bolt loosening and tightening operations designed to relieve stresses between rough and semi-finish boring operations.

The seven-station, hydraulically-operated, electrically controlled machine rough bores two carrier bearing holes, loosens and tightens four bearing cap bolts, semi-finish bores the two bearing surfaces and taps each bearing at a net production rate of 180 pcs/hr.

Instead of using pallet fixtures, parts are transferred in pairs from station to station on rails by a transfer mechanism. Two parts are machined in each station, the carrier bearings being individually bored by dual spindles in slide units on each side of the machine.

PROTECT YOUR FUTURE
BUY
U.S. SAVINGS BONDS
TODAY!

THINK of it!

NOW you can have a boring head that will **BORE, FACE, TURN** and **GROOVE** at no higher cost than you would pay for an ordinary, single purpose boring head.

THINK

This over before buying that NEW head!!

A Boring Head That Won't Face is NOT Complete

Model "D"

Models for Any Size Machine

Write today for full details

CHANDLER TOOL COMPANY
MUNCIE, INDIANA

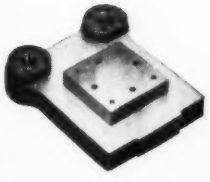
Chandler-Duplex

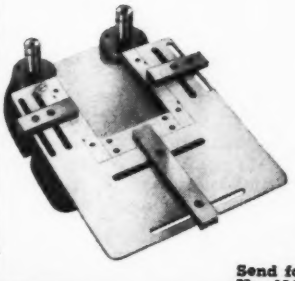
COMBINED BORING AND FACING TOOLHEADS

CIRCLE INFORM-A-GRAM KEY NO. 2131

Punches and Dies

Notching Die with Gauge Table





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

25th ANNIVERSARY 1932 1957

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

Send for free illustrated catalog No. 154 AF. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 2132

DRILL PRECISION HOLES IN ONE PASS

Gun Drilling Does It

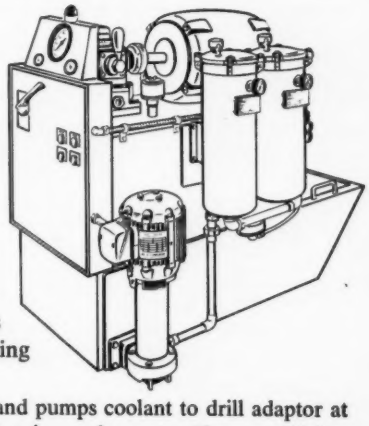
WITH SEALOL'S
DRILL ADAPTOR
AND
COOLANT SUPPLY UNIT

Deep or shallow precision holes in one pass . . . without those profit-cutting steps of boring, reaming or honing.

SEALOL DRILL ADAPTOR — converts your regular, solid-spindle drilling equipment for precision gun drilling of all types.

Transfers coolant from a stationary source to the rotating gun drill at speeds to 10,000 rpm — pressures to 1,000 psi. Coolant is delivered through the gun drill directly to the cutting edge. Work runs cooler; drills cut faster, more accurately and with less power.

SEALOL HI-PRESSURE COOLANT SUPPLY UNIT — provides a high volume of micro-clean coolant at proper pressures and volumes for precision drilling of *all* types.



Filters, cools and pumps coolant to drill adaptor at pressures to 1,000 psi — volume to 40 gpm (higher capacities available) for modern gun or oil-hole drilling.

MAIL THIS COUPON TODAY!

SEALOL CORP

DEPT. R, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.

Please send me Bulletin information on Sealol gun drilling equipment.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

CIRCLE INFORM-A-GRAM KEY NO. 2133

Magna-Lock chuck holds six tapered gibs during roughing operation.

PRODUCTION UP 25%

with

ELECTRO-MAGNETIC

Magna-Lock

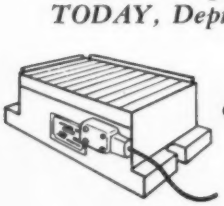
CHUCK

Magna-Lock chuck holds gib during finish grinding.

At Gisholt Machine Company, roughing and finishing operations on 24″ tapered gibs are done on a surface grinder. The gibs are held by a Magna-Lock chuck and are rough ground six at a time and finish ground individually. Spindle and table speeds for both operations is 1200 r.p.m. and 100 f.p.m. respectively. Stock removed is .020″ to .025″. There is no scrap, no rejects. Fixture set-up time is eliminated. Since using the Magna-Lock chuck, production has increased 25%.

This is one of the many examples of how the *extra holding power* of Magna-Lock all-steel, all-welded electro-magnetic chucks steps up production, reduces costs.

Solve your holding problems with Magna-Lock magnetic chucks—a complete line to meet your requirements. WRITE TODAY, Dept. TP-37.



Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U. S. A.

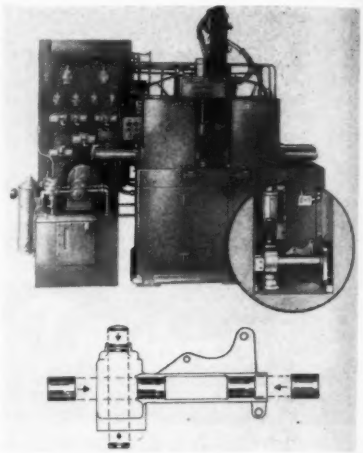
designers and makers of a complete line of magnetic chucks and devices.

CIRCLE INFORM-A-GRAM KEY NO. 214

UNIQUE ASSEMBLY MACHINE PERFORMS FIVE OPERATIONS

A unique, cost-saving assembly machine was recently delivered to a major automobile manufacturer. It was designed to perform the following operations automatically on steering gear housing assembly during a 10 sec cycle:

1. Hopper feed and press in place one welch plug.
2. Hopper feed and press in place two bushings.
3. Press in place one ball race.



4. Burnish ID of the two bushings.
5. Inspect ID of the two bushings.

The machine is illustrated with an insert showing the parts in place for the operation and a line drawing of parts in position.

The Machine Tool Division of Cadillac Stamp Co., 17315 Ryan Road, Detroit 12, designed, engineered, and built this automatic assembly machine.

INSTRUMENT GAGE DIVISION CREATED AT TAFT-PEIRCE

A new Instrument Gage Division has been established by Taft-Peirce Manufacturing Co. in an effort to further expand company development and production facilities for air and electronic air gaging, according to Vice President F. Steele Blackall III. The Woonsocket, R. I., firm first entered the instrument gaging field in 1947.

Franklin Meyer, Jr., has been appointed Manager of the new division. Prior to this he was Chief Engineer, Instrument Gages.

Install the **NEW**

Tool Setting Gage

On YOUR Jig Borer

Here is the new Euclid Tool Setting Gage in action! Accuracy with ease of operation make it outstanding in its field!

Take a finish cut on the first pass by setting the tool with a Euclid Gage. Eliminate the old trial - and - error method and —

- Save time
- Eliminate scrap
- Eliminate "shoulders" in the mouth of the bore
- Eliminate nervous strain and anxiety of the operator
- Increase production, and
- Obtain a bore of micrometic accuracy EVERY TIME

Write today for descriptive literature

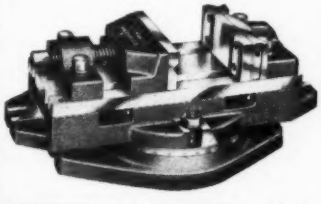
Euclid Instrument Co.

743 East 232nd St. • Euclid, Ohio

REdwood 1-5522

CIRCLE INFORM-A-GRAM KEY NO. 2151

INDESTRUCTIBLE



PRODUCTO HEAVY-DUTY 6" VISE

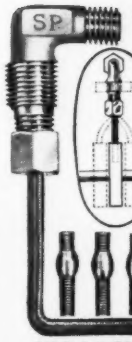
Here's an accurate machine shop vise that will give you years of hard service. Hardened and ground parts make it impossible to destroy vise by milling or drilling into jaws or body. Sold with or without swivel shown, or plain with ground sides. Write for Bulletin TE2-104.

THE PRODUCTO MACHINE CO.

970 Housatonic Avenue

Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 2152



SCREW MACHINES

Leigh Solderless Clutch Throw-out Bearing Oiler

A replacement filling and 5 flexible oiler tubes for 0, 00 and No. 2 Screw Machines. Requires no soldering, minimize down time. Complete package shown $2.00. Discount on quantity over 6. Post paid with check or money order.

SPRING Specialty Co.

23 North Fifth Ave.

Maywood, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2153

CAMS

To Your Specifications

• • • • •

— Except Screw Machine Cams —

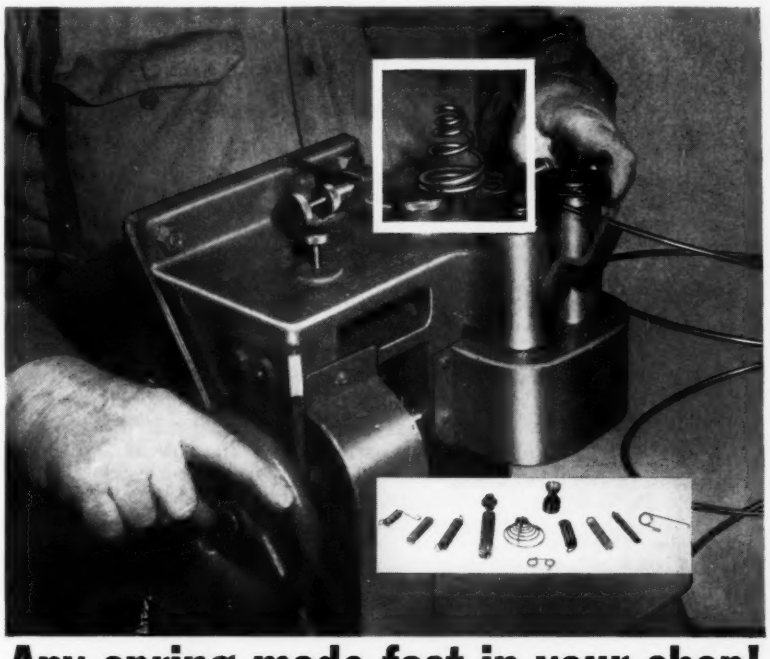
• • • • •

Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION

10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2154



Any spring made fast in your shop!

WITHOUT USE OF ARBORS

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005″ to .125″, you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32″ to 12″ and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications as replacements or experimental work. Make them fast, right in your own shop!

PERKINS

MACHINE AND GEAR CO.

Special Machinery Division, West Springfield, Mass.

Starret adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

Perkins Machine and Gear Co.
Special Machinery Division, Dept. B2
W. Springfield, Mass.
Please send information and prices on Perkins Spring Coiler.
Hand Model ☐ Power Model ☐

Name.....Title.....

Company.....

Address.....

City.....State.....

CIRCLE INFORM-A-GRAM KEY NO. 2155

MANUFACTURING MEMOS

Mergers . . .

Leake Stamping Co. recently consolidated with and merged into Monarch Products Co. The firm will be operated as a Monarch division with Joseph S. Leich as manager. Leake specializes in the production of metal stampings as well as building tools and dies.

The merger of The Cleveland Automatic Machine Co. and The J. H. Day Co., Inc., two Cincinnati, Ohio, firms, has been disclosed. The name of the continuing corporation is The Cleveland Automatic Machine Co. Complete lines of single spindle automatic screw machines and high-pressure, hydraulic die casting machines are produced by Cleveland Automatic and J. H. Day builds processing machinery.

Name Changes ...

Daco Instrument Co. is the new name of Daco Machine & Tool Co. The company is concerned with the design, prototype-making, tooling, manufacturing, and assembly of precise electro-mechanical instrumentation.

Plomb Tool Co. has changed its corporate name to Pendleton Tool Industries, Inc. The parent company plant, and a division located in Jamestown, N. Y., will operate under the name of Proto Tool Co., as divisions of Pendleton Tool Industries, Inc.

District Offices Opened . . . .

Jones & Lamson Machine Co. has opened a Boston District Office in Waltham, Mass. This office is responsible for the sales and service of J&L machine tools and optical comparators in Massachusetts, Rhode Island, and Connecticut. John H. Hinchliffe is serving as district manager.

To provide better service west of the Rocky Mountains, Diamonite Products Mfg. Co. of Canton, Ohio, has established western regional offices in Downey, Calif. Complete technical and sales service will be offered by the office, which will be managed by John P. Vajda.

Top Managements . . .

Ten firms have won the American Institute of Management rating of Excellent Management for 1956. They are Ex-Cell-O Corp., Chicago Pneumatic Tool Co., General Electric Co., Ingersoll-Rand Co., and Otis Elevator Co. Also named were American Chain & Cable Co., Briggs & Stratton Corp., Chain Belt Co., A. O. Smith Corp., and Elliott Co.

Baldwin-Lima-Hamilton Corp. has completed transfer of the manufacturing and sales operations of the hydraulic and compacting press department from the Eddystone Division near Philadelphia to the Hamilton Division in Hamilton, Ohio. The operations have been integrated with those of the mechanical press department.

◆

Purchase of the line of Mercury production grinders by Mattison Machine Works has been announced. All production rights including patents, engineering drawings, production tooling, and component parts already made were included in the purchase. The grinders were formerly built by Mercury Engineering Corp.

◆

C. Palmer Meredith, president of Steel Products Engineering Division of Kelsey-Hayes Co., and Lee A. Jones, president of Vulcan Tool Co., have announced the sale and purchase by Vulcan of the former's Brehm Die Division. Walter E. Callison, former assistant manager of Steel Products' Brehm Division, is expected to assume managerial duties with Vulcan's newest division.

◆

Argus Cameras, Inc., has transferred all of its properties and assets to Sylvania Electric Products Inc. The business of Argus will be operated as a division of Sylvania.

◆

Continued growth of Temco Aircraft Corp. has resulted in the Dallas plant's operations being reorganized on a divisional basis. John A. Maxwell, Jr. is serving as vice president and general manager of the Dallas division.

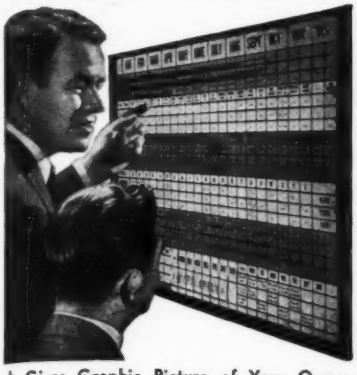
◆

Robertshaw-Fulton Controls Co. has acquired Acro Mfg. Co. Acro manufactures electric switches and house heating controls. In addition, Robertshaw-Fulton has bought The Beta Corp., producer of specialized vibration monitoring equipment. The operation of Beta Corp. will be moved to Philadelphia and consolidated with the Fielden Instrument Division.

◆

In a decentralization move, the Edmore, Mich., plant of the Metallurgical Products Department of General Electric Co. has become the Magnetic Materials Section of the department. General manager of the newly formed section is E. E. George.

You Get Things Done With Boardmaster Visual Control



- ☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
- ☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
- ☆ Simple to operate — Type or Write on Cards, Snap in Grooves
- ☆ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
- ☆ Made of Metal. Compact and Attractive. Over 100,000 in Use

Complete price **$49.50** including cards

FREE 24-PAGE BOOKLET NO. Z-200 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS

55 West 42nd Street • New York 36, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2171

JIG BORING

and

Large Precision Machining

Done to your specifications

We Have 21 Jig Borers

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2172

DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

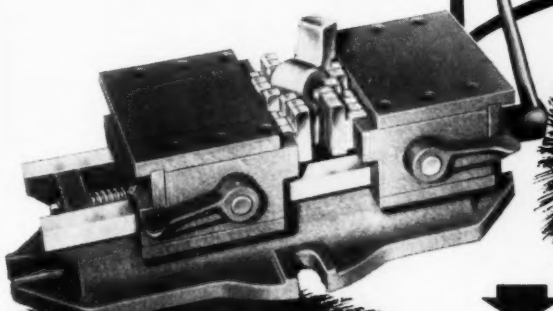
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 2173

BUY U. S. SAVINGS BONDS

NEW Contour Gripping FIXTURE

SAVES YOU MONEY!



CUTS SPECIAL FIXTURE COSTS

INSTANTLY GRIPS AND HOLDS ANY ODD SHAPED PIECE

TAKE BIGGER CUTS

- **FASTER**
- **SAFER**
- **CHEAPER**

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

Investigate its possible application in your business. Write for further details or demonstration.

NO MORE BLOCKING SHIMMING HOLDS ANY SHAPE IN ANY POSITION

WRITE for Further Information Today

Act Now!

AMPOGRIP CORP.

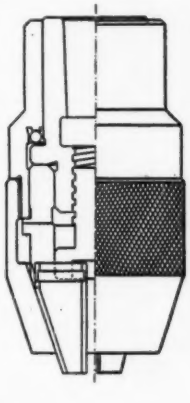
10K Olivine Street • Willimansett • Mass.

CIRCLE INFORM-A-GRAM KEY NO. 2174

THE RAPID

A SUPERIOR SWEDISH DRILL CHUCK

- Superior in Precision
- Automatic tightening with load
- Easy to open — No Key to misplace or cause accidents
- No chewed up tool shanks
- All parts properly hardened and Precision Ground



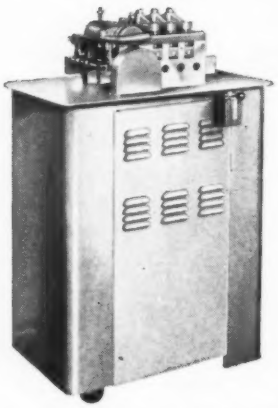
THE Universal Chuck for high precision machine **AND** mass production.

NEISE MODERN TOOLS

KARL A. NEISE 404 Fourth Avenue New York 16, N. Y., Dept. TP

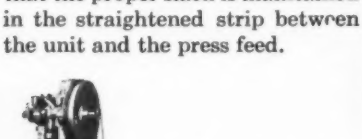
CIRCLE INFORM-A-GRAM KEY NO. 2175

FLEXIBILITY
in Stock Straightening



WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

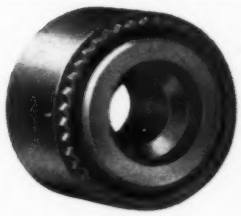
WITTEK Manufacturing Co.

5686

Production Feeding Equipment. WMCo.

4323 W. 24th Place • Chicago 23, Illinois
AUTO. IND.—SEPT. 15th
CIRCLE INFORM-A-GRAM KEY NO. 2181

PEM
Drill Bushings Revolutionize Template Production



- Simple, fast, cost-cutting. Pay for themselves in template production savings.
- One-hole, compression mounting. No riveting, No welding.
- Self clinching—bushings are positively locked into template in one operation.
- True alignment and center distances secured—automatically.
- Round—require no indexing or "nesting".
- High torque and pull out resistance.
- Permit thin gauge, light weight templates.

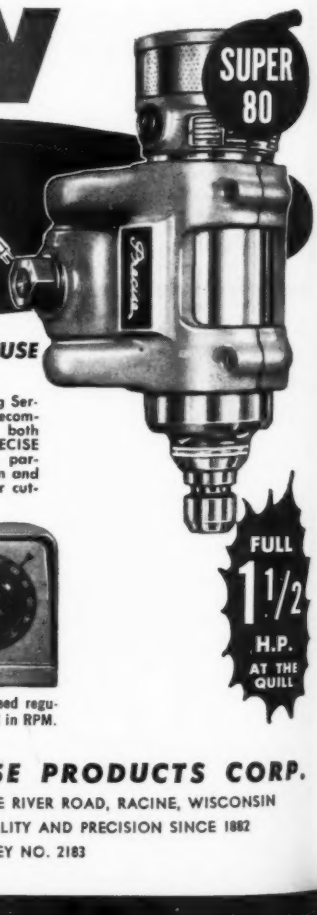
Write for literature and samples for trial.

PEM

PENN ENGINEERING & MANUFACTURING CORP.
Doylestown, Pennsylvania

CIRCLE INFORM-A-GRAM KEY NO. 2182

NEW
Precise POWER QUILL



HIGH-CYCLE PERFORMANCE WITHOUT USE OF COSTLY HIGH-CYCLE EQUIPMENT

Continuously Variable Speed Range Through Electric Control with Simple Dial Calibration — 7000 to 25,000 RPM.

Largest and Most Powerful Available.

Super Accurate Collet Chuck with ½" Capacity to Insure Maximum Rigidity for modern precision demands. (Available also with solid quill extension for mounting wheels to ½" I.D. and 2½" O.D.)

Unlimited adaptability to single or multiple grinding-milling operations . . . Tolerances of .0001".

Operates from standard 115V power supply.

Our Complete Engineering Service is available for recommendations and advice both on the application of PRECISE POWER QUILLS to your particular production problem and for the use of the proper cutting tool on your job.

Control cabinet permits speed regulation with meter calibrated in RPM.

PRECISE PRODUCTS CORP.
3741 BLUE RIVER ROAD, RACINE, WISCONSIN
QUALITY AND PRECISION SINCE 1882

CIRCLE INFORM-A-GRAM KEY NO. 2183

MAGNETIC MEMORY SYSTEM DESIGNED FOR AUTOMATION

A unique magnetic memory system, known as Magdelay, has been especially designed for delayed control of high speed continuous process lines and automatic sorting of items moving through complex conveyor systems.

In continuous material processing lines (e.g. sheet metal, wire, tubing, plastic, paper, textile) Magdelay is applicable wherever automatic measurements can be employed to control subsequent operations.

For example, a photocell might be used to measure off-color areas in cardboard strip. Thereafter the strip is printed and then cut for carton blanks. Magdelay will remember the location of each and every defective area and then cause the sorting mechanism to pull out all defective blanks. It will perform this function at all line speeds from zero on up.

In warehousing operations Magdelay is applicable wherever automatic switching can be used to direct packages or items to two or more destinations.

For example, a long conveyor line may be used to transport packaged products to several truck loading platforms. With this system the correct loading platform may be designated manually or automatically when each package is placed on the conveyor. As each package reaches its assigned destination, Magdelay initiates the package removal mechanism. Variations in speed of the conveyor, including starting and stopping of the line, do not disturb the correct timing of the sorting action.

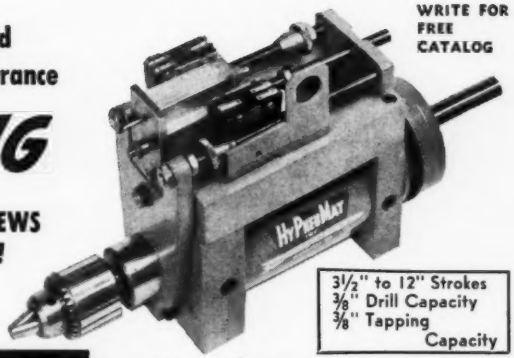
In these systems the measurements to be remembered are used to magnetize narrow sectors of a hardened steel disc. The disc rotates in synchronism with the processing or conveyor line. The measurements are then read off of the disc at the same time that the material that was measured reaches the action or sorting points. The read-out is accomplished no matter how slow or fast the line is moving, including if the line is stopped. After read-out the disc is erased and is ready for reuse.

Magdelay systems developed by Automation Incorporated, 212 Worcester St., Wellesly Hills, Mass., accept signals from almost all measuring devices such as photoelectric controls, pressure switches, relays, beta gauges, ultrasonic detectors, magnetic detectors, etc. No exact gearing or coupling ratio need be prescribed between the processing or conveyor line drive shaft and its input shaft. Long term reliability is assured by the absence of physical contact between the magnetic heads and the memory disc.

NOW High Speed Close Tolerance **TAPPING**

WITHOUT LEAD SCREWS OR TAPPING HEAD!!

WRITE FOR FREE CATALOG



3½" to 12" Strokes
⅜" Drill Capacity
⅞" Tapping Capacity

HYPNEUMAT AUTOMATIC DRILLING AND TAPPING UNITS!

- SEALED UNIT Construction permits mounting in any position.
- AIR or HYDRAULIC Control.
- ENCLOSED ELECTRICAL SWITCH for remote electrical operation.
- QUILL CLAMP EXTENSION—extremely close radial grouping.
- EASILY INTERLOCKED with indexing tables, automatic work feeders.

HYPNEUMAT INC. 647 West Virginia St., Milwaukee 4, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 2191

Rotary File Hardening Simplified At GROBET FILE CO.

"The Sentry Diamond Block Atmosphere Makes the Difference"

Sentry DIAMOND Block

Grobet File Co. of America, Inc., Carlstadt, New Jersey has eliminated spoilage in the hardening of its fine quality high-speed rotary files by use of Sentry equipment.

Sharp cutting edges formed by impact on chisel cut files are protected by the Sentry Diamond Block Atmosphere through the hardening cycle. No further sharpening is required.

Sentry furnaces employing the automatic Diamond Block atmosphere control require no analysis or regulation of furnace atmosphere. Consistent high quality hardening is assured.

Visit us at Western Metals Show • Booth 120 • March 25-29

Sentry TRADEMARK **ELECTRIC FURNACES**

Request Catalog H-43 *Write* **THE SENTRY CO., FOXBORO, MASS.**

CIRCLE INFORM-A-GRAM KEY NO. 2192

TWO-WAY MACHINES PERFORM JET ENGINE PARTS DRILLING

The two-way machines illustrated perform drilling operations on a variety of jet engine components in the plant of a west coast manufacturer.

Built by The Avey Drilling Machine Co., Incorporated, Cincinnati, these drilling machines feature Avey's Electrodex index tables which permit programming for different workpieces. These tables lend themselves to jobs that require even, uneven, or skip indexing such as found in the jet engine industry.

Change-over from one index pattern to another, either through mechanically changing index rings or electrical counting, is quick and provides unusual flexibility.

Some of the features offered by this unique index table are outstanding, such as:

A. Non-accumulative tolerance of ±0.001 between adjacent holes at a 48" dia. (This tolerance proportionally reduces at smaller diameter work circles).
B. The work pattern being produced may be varied by interchanging an index ring, which is located on the outer diameter of the table.
C. The table is securely locked in position during the work cycle by means of an automatic locator pin.
D. Irregular series of holes (having no common factor) may be as easily produced as regular spaced hole series.

E. By means of a simple manual or automatic selector, used in conjunction with a double row index ring, two different series of indexes may be produced for a workpiece, without disturbing its location. This design lends itself ideally to low production jobs where change-over takes place often.
F. Normal (or excess) wear of the driving pinion and gear has no effect on the accuracy of the indexed position.
G. Heavy work loading of the table is permissible since the table top outer diameter and center are supported on roller bearings.
H. The table may be "jogged" or rotated continually in the reverse direction.

The machine's large way-type columns move the drill units in and out for different bolt circles of work. Each machine employs variable feed, with six spindle speeds.

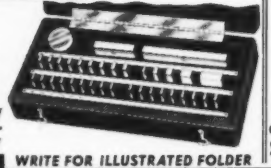
DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 2201

Monarch Precision SHAPLANE Radius Tools
Illustration shows convex cutter for 1/4" to 2 1/2" balls.
FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS
Range 1/2" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.
PATENT PENDING
Write for circular
C. B. TEETER, TOOL ROOM SPECIALTIES
4470 Oakenwald Ave., Chicago 15, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 2202

ULTRA-CHEX GAGE BLOCKS for Every Need!
Supplied in one Superior Accuracy
5 MILLIONTHS ± ACCURACY
34 BLOCK SET (shown) WITHOUT OPTICAL PARALLEL ... $132.50
82 BLOCK SET ..... $303.00 IN CASE
These sets will supply the needs of any discriminating shop that must work to gage-block precision. IMMEDIATE DELIVERY



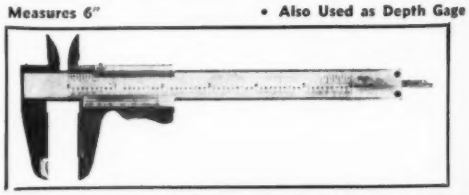
9 Block Set
For Individual Mechanic
$24.75
OPTICAL PARALLEL $6.00 Extra
WRITE FOR ILLUSTRATED FOLDER
GEO. SCHERR CO., INC.
200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2203

TUBE ROLL REGRINDING
We do it FASTER—CHEAPER—BETTER on our own design of
RADIUS ROLL GRINDER
CAPACITY: 1/4" to 3 1/2" radius 20" dia. Rolls
Send us a pair of rolls or specifications for a quotation.
COMPLETE SATISFACTION GUARANTEED
WE ALSO DESIGN AND MANUFACTURE ROLLS. QUICK QUOTES FURNISHED.
PATTERSON MACHINE COMPANY 3409 Trumbull St., Cleveland 15, Ohio
Builders of Automatic Wire Straightening and Cut Off Machines

CIRCLE INFORM-A-GRAM KEY NO. 2204

SATIN CHROME DOUBLE LENGTH VERNIER CALIPER
• Measures 6" • Also Used as Depth Gage



• Satin Finish
• Hardened Thru-out
• Double Length Vernier
• .001 and 1/128 Scales
• Decimal Equivalents on Back
$13.95 EACH
6 or More—$12.95 Ea. Case Incl.
DEALERS INQUIRIES INVITED
INSPECTION DEVICES CO.
5417 S. Halsted Street • Chicago 9, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2205

MAN PROTECTING A BIG INVESTMENT!

The man above is making a fine, positive adjustment on an EMPCO Leveling Jack, setting the machine level . . . making certain it delivers precision performance with minimum downtime . . . minimum cost! EMPCO Jacks provide a solid, smoothly adjustable foundation for machine tools, large surface plates, automation lines, tool room and production equipment of all types.

Used together with VI-SORB Mounting Pads, EMPCO Jacks control internal and transmitted vibrations. They reduce noise, retard creepage and frequently eliminate the need for anchor bolts.

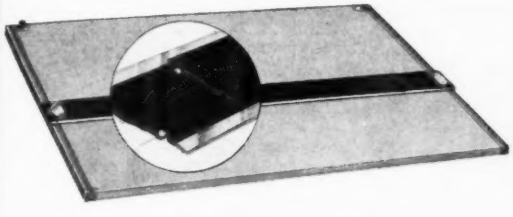
Jacks available in six styles, 25 models. Pads cut to fit. Write us about your machine installation problems.

EMPCO LEVELING JACKS

Send Today For Descriptive Bulletin No. 100.
The Enterprise Machine Parts Corporation
2735 Jerome Avenue Detroit 12, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 2211

MAYLINE



The *Mayline* Mobile

Finest Straightedge ot them all!

MAYLINE MAYLINE

A straightedge that moves easily and readily, yet hugs the paper at the slightest pressure. Keeps drawings cleaner. Blade is of phenolic laminate, edges are crystal clear butyrate.

When used with the Mayline counterbalance straightedge will hold position, even at the vertical angle. Other Mayline straightedges are: Regal, Ideal, and E-Z Grip. Available in lengths from 30″ thru 96″. Ask your dealer for complete information about the Mobile.

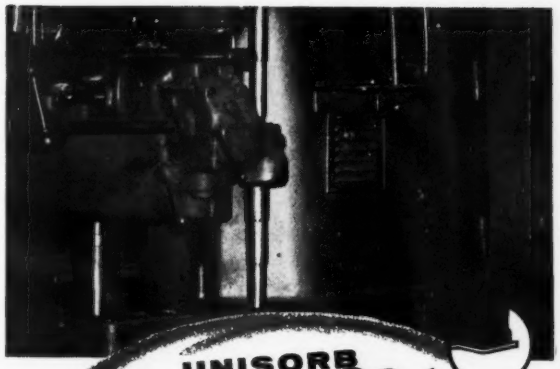
MAYLINE COMPANY INC.

635 No. Commerce St., Sheboygan, Wisconsin

MAYLINE

MAYLINE

CIRCLE INFORM-A-GRAM KEY NO. 2212



UNISORB

Save up to 30%

every time you install a machine!

You don't need bolts or lag screws, no hole drilling or floor patching. Just mount on Unisorb and the machine is ready to go in a short time. All this plus...

- Save up to 60% installation time
- Increase machine life
- Stop 85% of transmitted vibration

This FREE book shows how Unisorb has paid off for other plants — proved on the job. Send the reader service card today or write:

FE 5-14

the **FELTERS** company
202 SOUTH STREET, BOSTON 11, MASS.
Manufacturers of Felt and Felt Products
REPRESENTATIVES IN ALL PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 2213

ARROW TOOL & REAMER CO. • Established 1916

Manufacturing skill and tool making experience for over 37 years — adds up to preference for Arrow End Mills.

ARROW TOOL & REAMER CO.

711 Stephenson Highway
P. O. Box 338 • Troy, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 2214

ADVERTISERS' INDEX

Ace Drill Bushing Co., Inc. 146
Ace Drill Corp. 165
Acme Tool Co. 223
Acromatic Tool Co. 116
Advance Products 154
Aget Mfg. Co. 208
Air-Mite Devices, Inc. 176
Alina Corp. 203
Allegheny Ludlum Steel Corp. 137
Allen, Alva F. 158
Allen Mfg. Co. 139
Allied Products Corp., Richard Brothers Punch Div. 68
American Drill Bushings Co. 5
American Positive Grip Vise Corp. 217
Armstrong Bros. Tool Co. 182
Arrow Tool & Reamer Co. 221
Atlas Press Co., Clausing Div. 138
Austin Industrial Corp. 52
Automation Devices, Inc., Vibratory Feeder Co. Div. 211
Avildsen Tools & Machines, Inc. 200

Balas Collet Mfg. Co. 226
Barnes Co., Inc., W. O. 38
Bausch & Lomb Optical Co. 48
Bay State Abrasive Products Co. 42
Bearings, Inc. 202
Bellows Co., The 65
Benchmaster Mfg. Co. 14
Besly-Welles Corp. 44
Black Diamond Saw & Machine Works 211
Black Drill Co., Inc. 196
Blake Co., Inc., Edward 180
Bliss Co., E. W. 140
Bodine Corp., The 35
Bokum Tool Co. 206
Brown & Sharpe Mfg. Co. 109
Buckeye Tools Corp. 12
Bullard Co., The 51
Bushman Co., H. L. 158

Cadillace Gage Co. 25
Carroll-Jamieson Machine Tool Co. 184
Challenge Machinery Co., The 141
Chandler Tool Co. 213
Chicago Screw Co. 18
Cincinnati Milling Machine Co., The 105
Clausing Div., Atlas Press Co. 138
Cogsdill Tool Products 167
Comet Tool Co. 187
Commander Mfg. Co. 179
Comtor Co. 207
Cone Automatic Machine Co. 26
Continental Tool Works, Div. Ex-Cell-O Corp. 150
Cook, Inc., Lawrence H. 175
Cooper Weymouth, Inc. 204
Cosa Corp. 178
Covel Mfg. Co. 54
Crucible Steel Co. of America 10
Cullen Mfg. Co. 191

Dayton Rogers Mfg. Co. 157, 176, 183
Dearborn Gage Co. 63
Derbyshire, Inc., F. W. 179
Detroit Power Screwdriver 50
Detroit Stamping Co. 175, 200
DeVlieg Machine Co., DeVlieg Microbore Div. 53
Dickerman Mfg. Co., H. E. 171
DoAll Co., The 23
Dow Chemical Co., The 129
Dremel Mfg. Co. 195
Drillmation Co. 166
Dumore Co., The 41
Durable Punch & Die Co. 168
Durant Tool Supply Co. 152
Dykem Co., The 220

Eastern Machine Screw Corp., The 184
Eastman Kodak Co. 69
Eclipse Counterbore Co. 156
Economy Tool & Machine Co. 203
Eisler Engineering Co., Inc. 166
Elox Corp. of Michigan 32
Enco Mfg. Co. 166
Enterprise Machine Parts Co. 221
Erickson Tool Co. 72
Ettco Tool Co. 162
Euclid Instrument Co. 215
Ex-Cell-O Corp., Continental Tool Works Div. 150

Falcon Tool Co. 22
Feedall, Inc. 208
Felters Co., The 221
Fenn Mfg. Co. 135

Gaertner Scientific Corp., The 47
Gage Co. 157
Gardner-Denver Co., Keller Tool Div. 20
Genesee Mfg. Co. 187
Glover Mfg. Co. 152
Goddard & Goddard Co. 16
Gorton Machine Co., George 56
Govro-Nelson Co. 204
Graphic Systems 217
Greist Mfg. Co., The 205

Hamilton Tool Co., The 151, 153, 155
Hanchett Magna-Lock Corp. 214
Hannifin Corp. 192
Hardinge Brothers, Inc. 134
Harig Mfg. Corp. 61
Hartford Special Machinery Co., The 112
Hause Engineering 157
Heimann Mfg. Co. 175
Hendey Machine Div., Barber-Colman Co. 13
Hevi Duty Electric Co. 201
Hill Acme Co. 8, 188
Hi-Shear Rivet Tool Co., The 187
Horberg Gage Co., The 192
Hovis Screwlock Co. 194
Huebner Publications, Inc. 58, 212
Humm Safety Equipment Co. 166
Hutchinson Co., William T. 191
Hypneumat, Inc. 219

REGIONAL REPRESENTATIVES

ALTADENA, CALIF.: M. P. Pugh, Don Pugh, 2721 N. Marengo Ave., SYcamore 7-2894

CHICAGO 1: Robert R. Pierson, 333 N. Michigan Ave., FRanklin 2-4811

CLEVELAND 18: Jerry J. Miller, 1975 Lee Rd., FAirmount 1-4040

DETROIT 2: R. F. Pickrell, Larry Pickrell, 318 Stephenson Bldg., TRinity 1-0790

NEW YORK: H. Thayer Hezton, 94 Garfield Place, Lynbrook, L. I., LYnbrook 9-2305

NEW ENGLAND: R. N. Jorgenson, P. O. Box 55, Granby, Conn., OLdfield 3-6759, OLdfield 3-6850

Ideal Industries, Inc. 180
Industrial Tectonics, Inc. 176
Ingersoll-Rand Co. 126, 127
Inspection Devices Co. 220

Jaco Devices, Inc. 158, 166, 191
Jarke Mfg. Co. 184
Jergens Tool Specialty Co. 195
Jersey Mfg. Co. 170
Jiffy Mfg. Co. 223
Johnson Mfg. Corp. 186
Jones & Lamson Machine Co. 148, 159

Kaufman Mfg. Co. 207
Kearney & Trecker Corp., Special Machinery Div. 46
Kenco Mfg. Co. 200
Kennametal, Inc. 142
Kidde Precision Tool Corp. 215, 217

Lapeer Mfg. Co. 204
LaSalle Tool, Inc. 28
Lassy Tool Co. 191
Lavallee & Ide, Inc. 4
Lee Co., K. O. 161, 207
Lempco Industrial, Inc. 164
Lepel High Frequency Labs, Inc. 132
Lincoln Gage Co. 162
Lodding, Inc. 193
Logansport Machine Co., Inc. 152
Lovejoy Tool Co., Inc. 208

Machine Products Corp. 24
Marx Co., Clarence J. 183
Matthews & Co., Jas. H. 199
May-Fran Engineering, Inc. 36
Mayline Co. 221
McCrosky Tool Corp. 209
Mead Specialties Co. 195
Medelton Co. 210
Melin Tool Co., Inc. 177
Metal Carbides Corp. 170
Metallurgical Products Dept. of General Electric 27
Meyers Co., Inc., W. F. 196
Micrometrical Mfg. Co. 70
Miller Fluid Power Div., Flick Reedy Corp. 21
Mohawk Tools, Inc. 143
Monroe Engrg. Products, Inc. 158
Moore Special Tool Co., Inc. 122
Morris Co., The Robert E. 64
Morrison Engrg. Co. 154

National Acme Co., The 33
Neise, Karl A. 207, 217
Nicholson File Co. 149
Nobur Mfg. Co. 207
Northwestern 9
Numberall Stamp & Tool Co. 175

Ohio Knife Co., The 45
O'Neil-Irwin Mfg. Co. 57
Opto-Metric Tools, Inc. 195

Parker-Kalon Div., General American Transportation Corp. 125
Patterson Machine Co. 220
Penn Engrg. & Mfg. Corp. 218
Perfex Gage & Tool Co. 191
Perkins Machine & Gear Co. 215
Pioneer Engrg. & Mfg. Co. 34
Pivot Punch & Die Corp. 175
Plastic Center, The 162
Pope Machinery Corp. 190
Portage Double-Quick Tool Co. 181
Porter Precision Products 160
Potter & Johnston Co. 71
Pratt & Whitney Co., Inc. 107, 119
Precise Products Corp. 218
Producto Machine Co. 215
Putnam Tool Co. 3

Reid Brothers Co., Inc. 108
Reid Tool Supply Co. 180
Rice Pump & Machine Co. 152
Richard Brothers Punch Div., Allied Products Corp. 68

Richards Co., J. A. 191
Robbins Co., Omer E. 189
Rockford Die & Tool Works, Inc. 169
Ross Operating Valve Co. 6
Rotor Tool Co. 145

Sales Service Machine Tool 163
Scherr Co., Inc., George 176, 220
Schmidt, Inc., Geo. T. 196
Scully-Jones & Co. 123
Sealol Corp. 213
Sentry Co., The 219
Service Machine Co. 165
Sesco, Inc. 197
Sheldon Machine Co., Inc. 198
Shore Instrument & Mfg. Co., Inc. 166
Silber Products, Inc. 170
Size Control Co., Div. of American Gage & Machine Co. 59
Small Lot Stamping Co. 165
Sonnet Tool & Mfg. Co. 185
Sopko & Sons Co., Wm. 170
South Bend Lathe Works 161
Spellman Co., R. L. 161
Sperry Products, Inc. 30
Spiral Step Tool Co. 188
Spitfire Tool Co. 203
Spring Specialty Co. 215
Standard Electrical Tool Co. 174
Standard Parts Co. 136
Standard Pressed Steel Co. 29
Stebar Co. 152
Sturdy Broaching Service 179
Superior Steel Products Corp. 120
Sutton Tool Co. 2
Syntron Co. 128

Tannewitz Works, The 188
Teeter, C. B. 210, 220
Thompson & Son, The Henry G. 60
Thriftmaster Products Corp. 169
Tietzmann Tool Corp. 161, 200
Tomco Products Co. 158
Turchan Follower Machine Co. 49
Twentieth Century Mfg. Co. 199

Uddeholm Co. of America, Inc. 144
Universal Engineering Co. 15

Valvair Corp. 133
Van Norman Machine Co. 130
Vapor Blast Mfg. Co. 17
Verson Allsteel Press Co. 225
Vlier Engineering, Inc. 31
Vulcan Tool Co. 117, 183

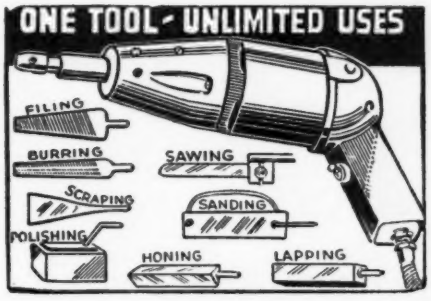
Wales-Strippit Corp. 62
Walls Sales Corp. 191
Walton Co., The 208
Ward Machinery Co. 213
Wardwell Mfg. Co., The 165
Warner Development Co. 210
Warner & Swasey Co. 11
Watts Brothers Tool Works 217
Watts Regulator Co. 115
Weldon Tool Co. 19
Wells Mfg. Corp. 211
Wesson Co. 39
West Point Mfg. Co. 37
Whistler & Sons, Inc., S. B. 169
Wirth & Son, Inc., Carl 199
Wittek Mfg. Co. 218
Woodson Tool Co. 154
Woodworth, N. A. 158

Yoder Co., The 154
Yost Mfg. Co. 175

Zagar Tool, Inc. 124

STOP . . . HAND WORK

Use these Handy PORTABLE ELECTRIC RECIPROCATING TOOLS for Greater Production, Better, More Uniform Work — All with less Operator Fatigue. Fixed Strokes are ⅛" or ⅜" long. Operate on 110 volts AC-DC. Deliver 1000 PUSH-PULL strokes per minute.



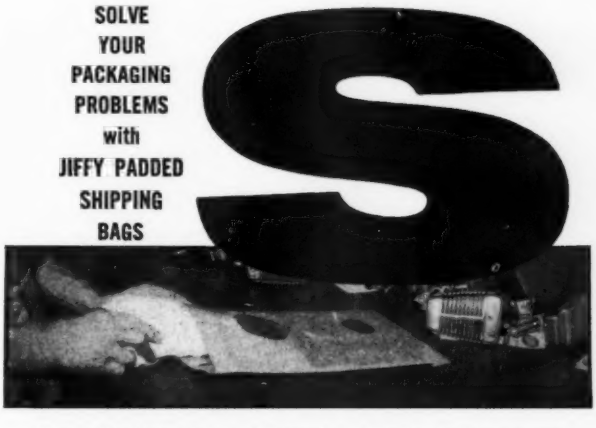
Try one of these tools on your next job.

ACME TOOL COMPANY

75 WEST BROADWAY **NEW YORK 7, N. Y.**

CIRCLE INFORM-A-GRAM KEY NO. 2231

SOLVE YOUR PACKAGING PROBLEMS with JIFFY PADDED SHIPPING BAGS



Shure Brothers, Inc., of Evanston, Illinois, leading manufacturers of microphones and electronic components, find that Jiffy Bags answer their particular packaging need.

The cushioning of Jiffy Bags absorbs all shocks—protects delicate mechanisms from damage.

Jiffy Bags are flexible—conform to uneven contours, protect contents from shifting. They are neat—eliminate loose fillers and dunnage. And in addition, Jiffy Bags are water resistant—prevent moisture damage.

If you have a product which requires special packaging treatment—send it in to our Package Engineering Section. We will design a package just for you. There is no charge for this service!

JIFFY MANUFACTURING CO.

383 FLORENCE AVENUE HILLSIDE, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2232

CUMULATIVE EDITORIAL INDEX FOR 1957 ISSUES

TOOLING & PRODUCTION Magazine

The number of subjects on which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tooling and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

The Publisher

SUBJECT INDEX

Abrasive machining
- Belt grinding of motor rotors, Jan. p. 151 (1/2 p)
- New techniques in machining methods, Jan. p. 63 (6 pp)

Adhesives
- Epoxy bonding of carbides to steel, Feb. p. 79 (5 pp)

Air power
- Notebook: Tips on air equipment maintenance, Feb. p. 111 (4 pp)

Apprenticeship
- Program building, Jan. p. 11 (3 pp)

Automatic handling
- Basketing workpieces, Feb. p. 119 (1/2 p)
- Demand-feed distribution system, Jan. p 77 (1/3 p)
- Shuttle transfer conveyor, Jan. p. 108 (1/4 p)

Bonuses for supervisors, Feb. p. 148 (1 p)

Boring heads, multi-diameter, Feb. p. 89 (6 pp)

Broaching machine, automated, Jan. p. 154 (1/2 p)

Carbide
- Bonding with epoxy, Feb. p. 79 (5 pp)
- Dies produce quality parts, Feb. p. 58 (1 p)
- Grades classified, Feb. p. 95 (4 pp)
- Machining hi-temp alloys with, Feb. p. 73 (6 pp)
- Metallurgy, Feb. p. 95 (4 pp)
- Milling with, Feb. p. 85 (4 pp)

Coated abrasive machining methods, Jan. p. 63 (6 pp)

Controls
- Electro-hydraulic servo system, Jan. p. 104 (1/2 p)
- Electro-hydraulic transducer, Feb. p. 105 (5 1/2 pp)
- Numerical, in aircraft industry, Feb. p. 48 (1 1/2 pp)
- Press "non-repeating" system, Jan. p. 108 (1/3 p)
- Welding, Feb. p. 110 (3/4 p)

Coolants for abrasive machining, Jan. p. 67 (1/2 p)

Countersink, self-aligning, Jan. p. 94 (1/3 p)

Cutting tools, multi-diameter, Feb. p. 89 (6 pp)

Deburring of copper tubing, Jan. p. 78 (1 p)

Die sinker, equipped for deep tracing, Feb. p. 105 (5 1/2 pp)

Drilling machine, deep hole, Jan. p. 51 (1/4 p)

Drilling variable workpieces, Jan. p. 69 (3 pp)

Economics, industrial
- Editor's look at '57, Jan. p. 61 (1 p)
- Machine tool outlook for '57, Jan. p. 72 (5 2/3 pp)
- Machine tool sales to hit billion dollars, Jan. p. 156 (1/2 p)
- Tool and die forecast for '57, Jan. p. 156 (3/5 p)

Grinding and finishing
- Abrasive machining methods, Jan. p. 63 (6 pp)
- Belt grinding of motor rotors, Jan. p. 151 (1/2 p)
- Cylindrical machine for large, light work, Jan. p. 147 (1/3 p)

Heat treating
- Rapid quenching with reduced distortion, Jan. p. 78 (3 1/2 pp)

Inventory management principles, Jan. p. 83 (4 pp; 12 pp in Nov. and Dec. '56 issues)

Jigs and fixtures
- Drill jig centers variable workpieces, Jan. p. 69 (3 pp)
- Plastic, for short runs, Feb. p. 182 (3/4 pp)

Machine tool industry
- Machine tool sales to hit billion, Jan. p. 156 (1/2 p)
- Outlook for '57 by industry leaders, Jan. p. 72 (5 2/3 pp)

Machining
- High temperature alloys with carbides, Feb. p. 73 (6 pp)
- Profiling numerically controlled, Feb. p. 48 (1 1/2 pp)
- Tracing without templates, Feb. p. 105 (5 1/2 pp)

Maintenance, preventive, Feb. p. 120 (1 1/3 pp)

Management
- Bonuses for supervisors, Feb. p. 148 (1 p)
- Preventive maintenance records, Feb. p. 120 (1 1/3 pp)
- Scheduling engineers' activities, Feb. p. 173 (1/2 p)
- Time study of punch-press operations, Feb. p. 99 (6 pp)

Metallurgy of carbides, Feb. p. 95 (4 pp)

Methods-time measurement, Feb. p. 99 (6 pp)

Milling head, hydraulic, Feb. p. 116 (1 p)

Milling with carbides, Feb. p. 85 (4 pp)

Personnel management
- Bonuses for supervisors, Feb. p. 148 (1 p)
- Hiring new employees, Feb. p. 14 (1 p)
- Selection testing, Jan. p. 46 (2/3 p)

Presses
- "Non-repeating" safety system, Jan. p. 108 (1/3 p)
- Punch, time study of operations, Feb. p. 99 (6 pp)

Preventive maintenance, usable records, Feb. p. 120 (1 1/3 pp)

Quenching with reduced distortion, Jan. p. 78 (3 1/2 pp)

Reader participation, Feb. p. 71 (1 p)

Safety, holding employee interest in, Jan. p. 140 (1 1/4 pp)

Scrap disposal, automatic, Jan. p. 149 (1/2 p)

Steel standards, guide to specifying, Feb. p. 126 (1 2/3 pp)

Tubing, deburring of copper, Jan. p. 78 (1 p)

Welding
- Automatic arc, Jan. p. 82 (1/2 p)
- Controls, Feb. p. 110 (3/4 p)
- Spatter problem solved, Feb. p. 118 (1 p)

AUTHOR INDEX

Anderlite, E. V.—Carbide Metallurgy Simplified, Feb. p. 95 (4 pp)

Baily, Oliver L and John M. Morgan—Tracing Without Templates, Feb. p. 105 (5 1/2 pp)

Dyer, Hugh N.—New Techniques in Coated Abrasive Machining Methods, Jan. p. 63 (6 pp)

Fair, Ernest W.—Holding Employee Interest in the Safety Program, Jan. p. 140 (1 1/4 pp); Supervisors Need Bonuses Too, Feb. p. 148 (1 p)

Gable, Frank—Multi-Diameter Hole Engineering, Feb. p. 89 (6 pp)

Goddard, Lewis H. and Fred W. Lucht—40 Pointers for Milling with Carbides, Feb. p. 85 (4 pp)

Gould, Bernard—Try Carbide Bonding with a No-Mix Epoxy, Feb. p. 79 (5 pp)

Gurski, Joseph—Application Guides in Specifying Steels, Feb. p. 126 (1 2/3 pp)

Halliday, W. M.—Drill Jig Automatically Centers Workpieces of Different Sizes, Jan. p. 69 (3 pp)

Hoffman, William E.—Air Tool User's Notebook, Feb. p. 111 (4 pp)

Hutchison, C. E.—Usable Records: Basis of Preventive Maintenance, Feb. p. 120 (1 1/3 pp)

Lucht, Fred W. and Lewis H. Goddard—40 Pointers for Milling with Carbides, Feb. p. 85 (4 pp)

Marsilius, Philip R.—Apprenticeship: Why, Who and How, Jan. p. 11 (3 pp)

Montgomery, William E.—Machining High Temperature Alloys with Carbides, Feb. p. 73 (6 pp)

Morgan, John M. and Oliver L. Baily—Tracing Without Templates, Feb. p. 105 (5 1/2 pp)

Norton, Irving H.—Methods—Time Measurement as Applied to Punch-Press Operations, Feb. p. 99 (6 pp)

Reinfeld, Nyles V.—Principles of Inventory Management, Part III—Miscellaneous Inventory Problems, Jan. p. 83 (4 pp)

Taylor, Erwin K.—Packages and Panaceas, Jan. p. 46 (2/3 p); Who Hires, Feb. p. 14 (1 p)

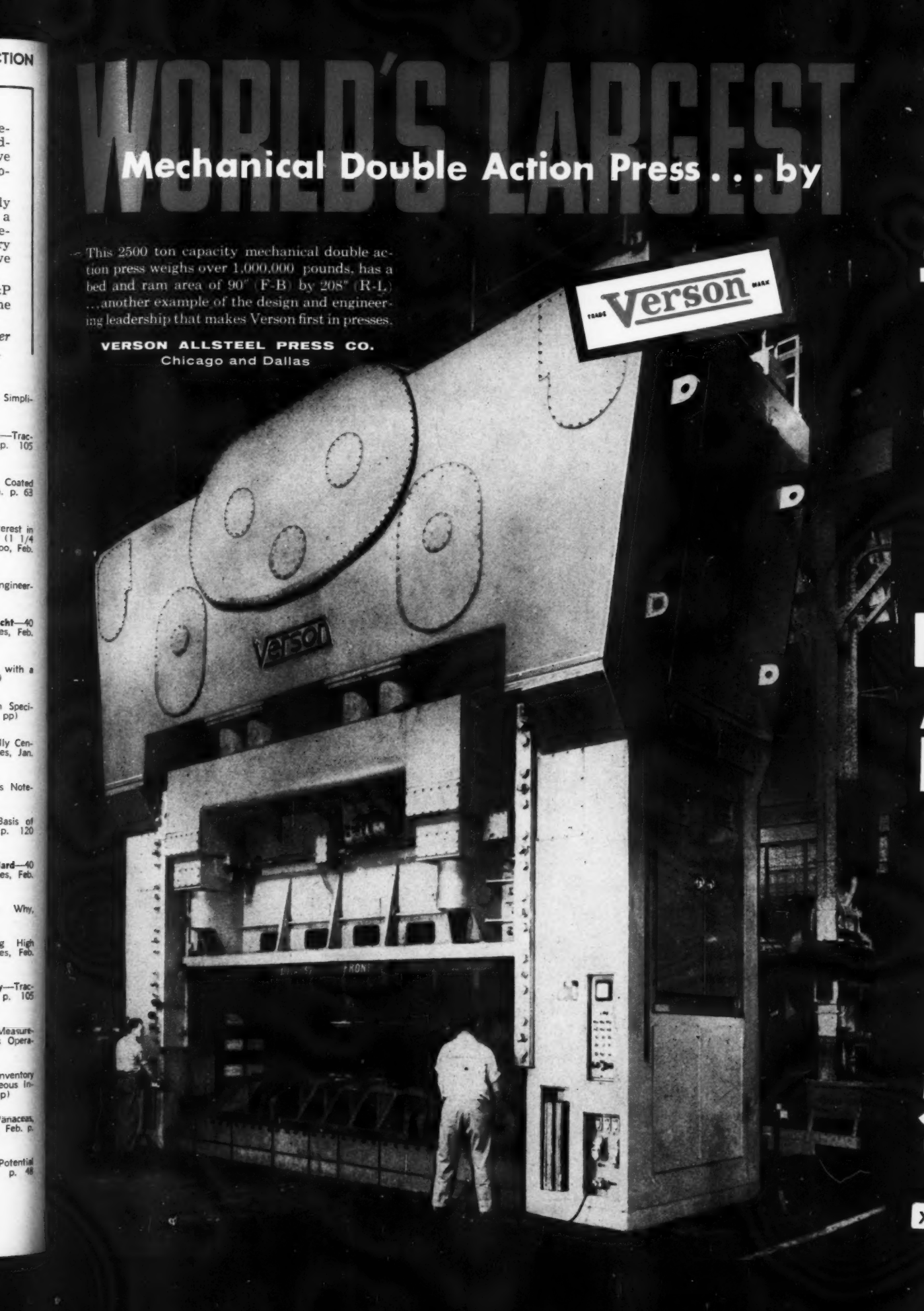
Wood, K. G.—Numerical Control Potential in the Aircraft Industry, Feb. p. 48 (1 1/2 pp)

WORLD'S LARGEST

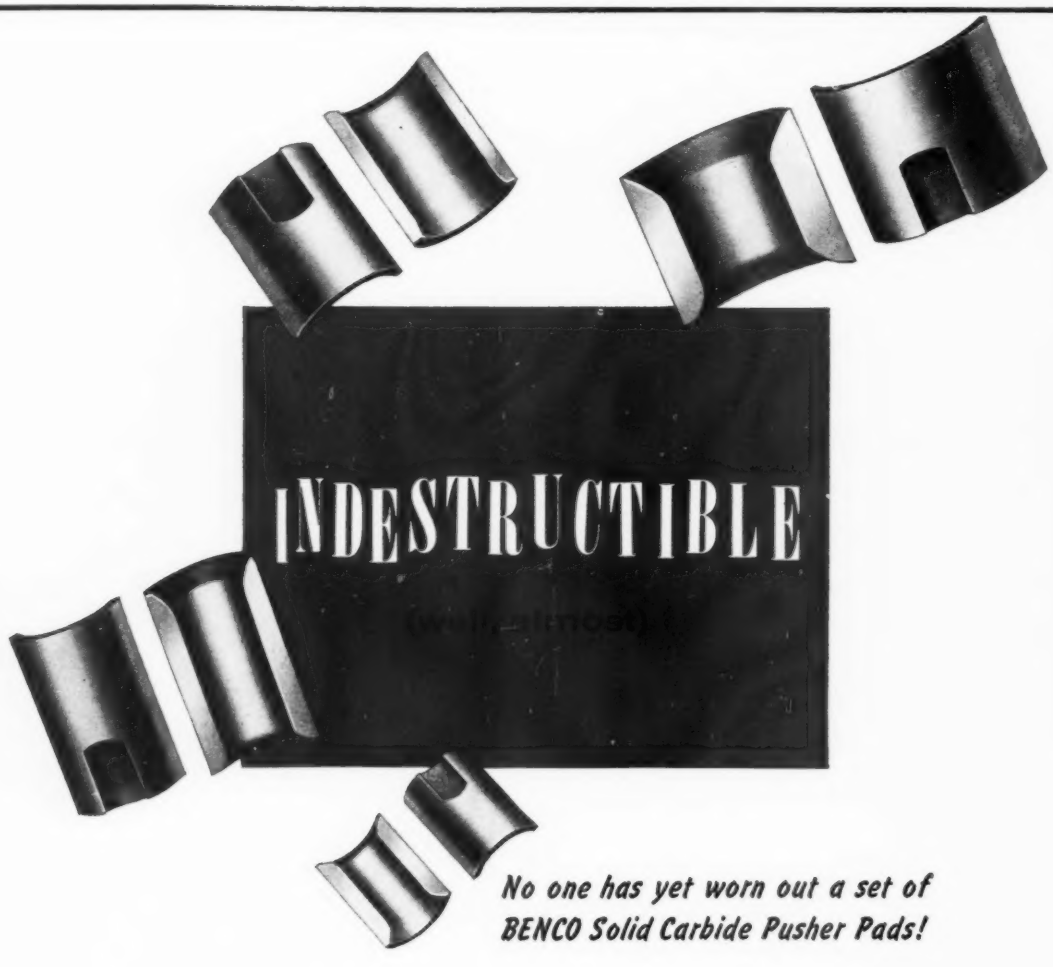
Mechanical Double Action Press . . . by

This 2500 ton capacity mechanical double action press weighs over 1,000,000 pounds, has a bed and ram area of 90" (F-B) by 208" (R-L) ...another example of the design and engineering leadership that makes Verson first in presses.

VERSON ALLSTEEL PRESS CO.
Chicago and Dallas



HUEBNER PUBLICATIONS, INC.
1975 Lee Rd., Cleveland 18, O.
RETURN POSTAGE GUARANTEED



No one has yet worn out a set of BENCO Solid Carbide Pusher Pads!

BENCO carbide pusher pads

Benco Solid Tungsten Carbide Pusher Pads for our standard Model "A" Master Pushers have a life expectancy of at least 35 times that of steel pads...in addition, they are non-scratching and non-galling! Moreover, for the first time SOLID Carbide pads are priced so conservatively that you can't afford not to use them. Both they and our Master Pushers are carried in stock for immediate shipment. Why put up with the difficulties caused by most ordinary pusher pads any longer? Change to Benco Solid Carbide Pads today!

Write for new catalog.

BENCO COLLET MANUFACTURING CO.

ds

o.